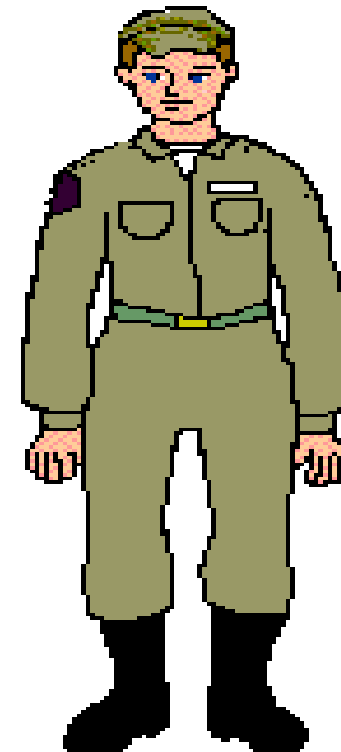




Armed Forces College of Medicine AFCM





Movements of Joints of Upper Limb

By
Prof Azza Kamal

Intended Learning Outcomes

- **By the end of this lecture, each student should be able to:**
 - 1.List** movements of shoulder girdle, shoulder joint, elbow, radioulnar, wrist & hand joints.
 - 2.Predict** muscles producing the movements of the above mentioned joints.
 - 3.Describe** clinical applications of movements of joints of the upper limb.

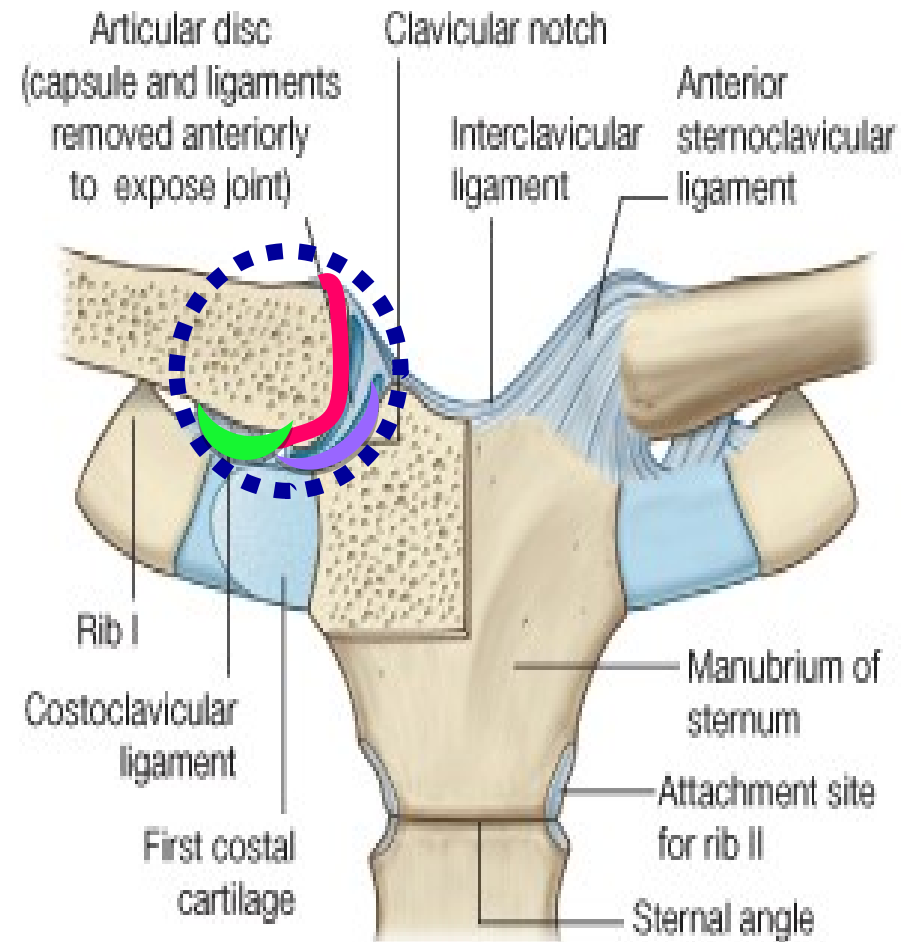


KEY POINTS OF THE LECTURE

1. Movements of different joints of the upper limb
2. Muscles producing these movements
3. Relevant applied anatomy

Sternoclavicular joint

- **Type:**
- **Synovial, Saddle joint**
- **Articulating surfaces:**
- **Medial end of clavicle**
- **With clavicular notch of sternum & adjacent part of upper surface of 1st costal cartilage**

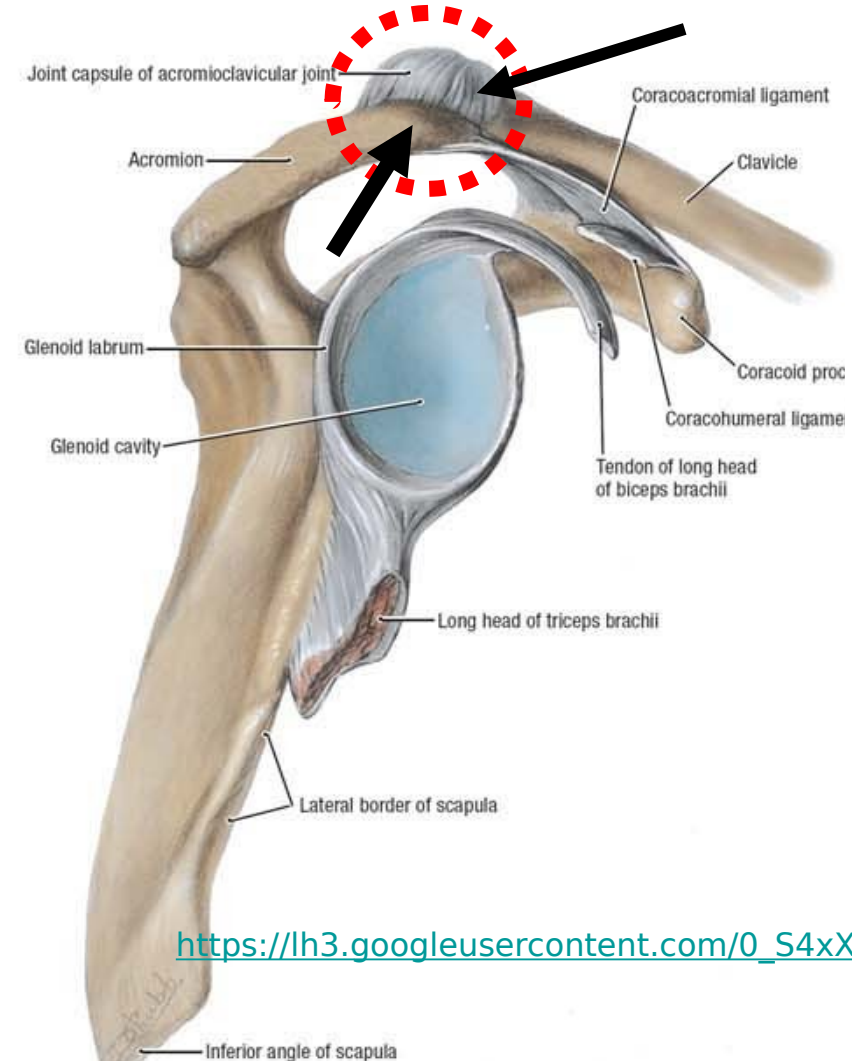


<https://lh3.googleusercontent.com/gPoNH8ZV>



Acromioclavicular joint

- **Type:**
- **Plane synovial joint**
- **Articulating surfaces:**
- **Facet on medial surface of acromion process of scapula with acromial end of clavicle**



https://lh3.googleusercontent.com/0_S4xXRmecWzx1FX

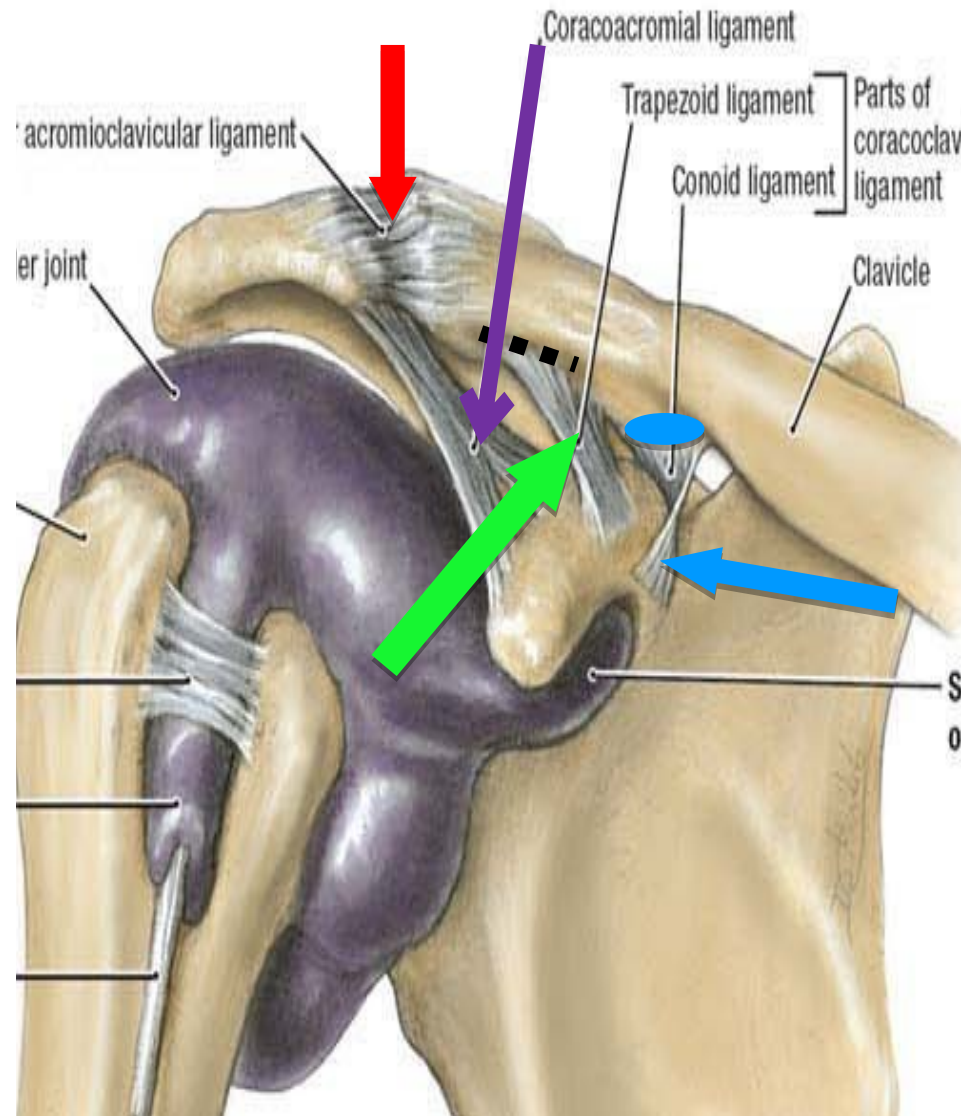
- **Ligaments of acromioclavicular joint:**

1. Small acromioclavicular ligament

2. Large & strong coracoclavicular ligament formed of 2 parts:

a) Trapezoid part attached to trapezoid line of clavicle

b) Conoid part attached to

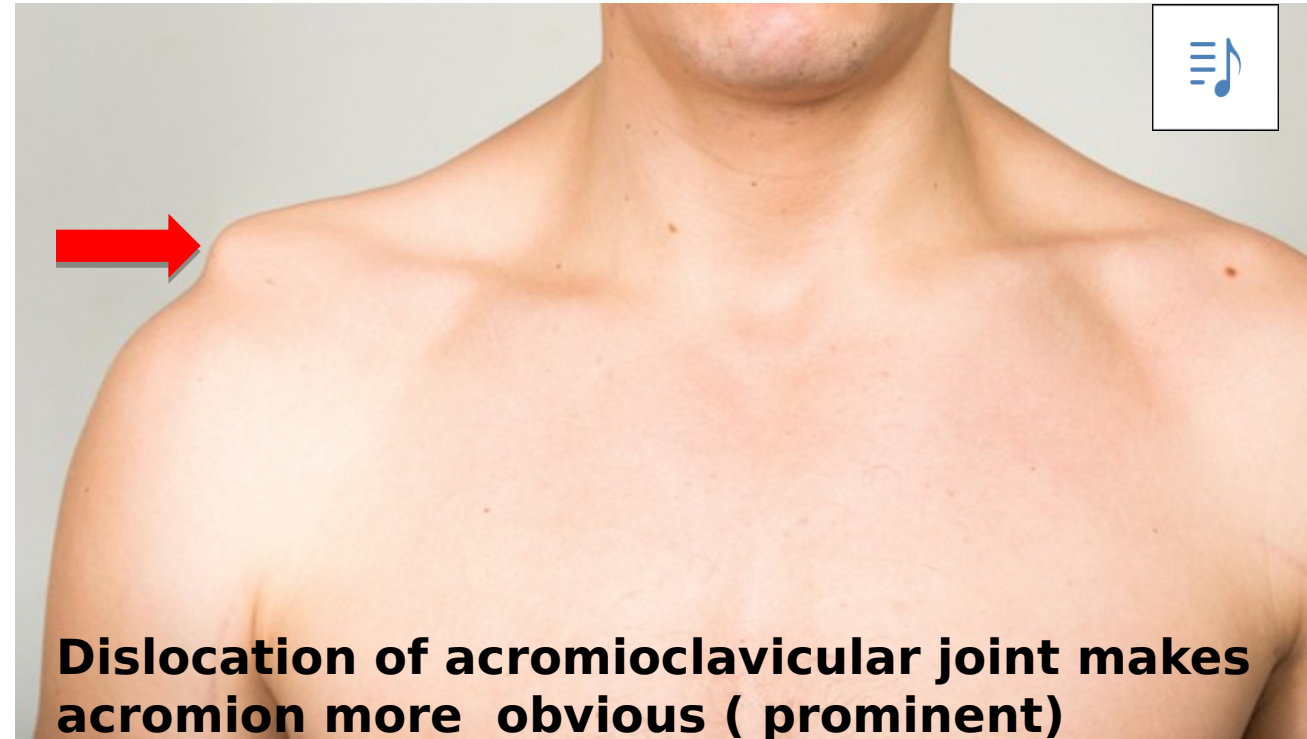


★ The strength of acromioclavicular joint depends on the very strong . coracoclavicular ligament

★ The greater part of the weight of the Upper Limb is transmitted to the clavicle through coracoclavicular ligament.

: Clinical Note

A hard fall on the shoulder as during playing football, soccer or hockey could result in rupture of coracoclavicular ligament □ shoulder falls away from clavicle owing to the weight of the UL



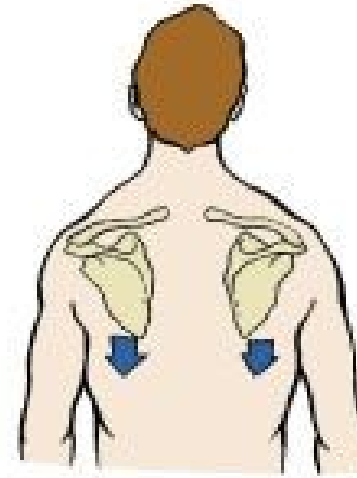
<https://lh3.googleusercontent.com/tGzH9F16EfNHZXgV>

Movements of the shoulder Girdle

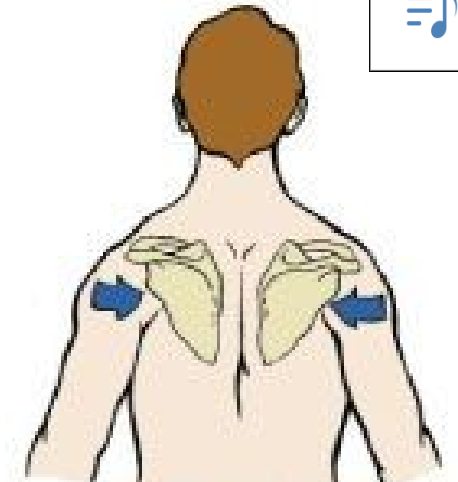
- **Movements of the clavicle at the sternoclavicular and acromioclavicular joints are always associated with**



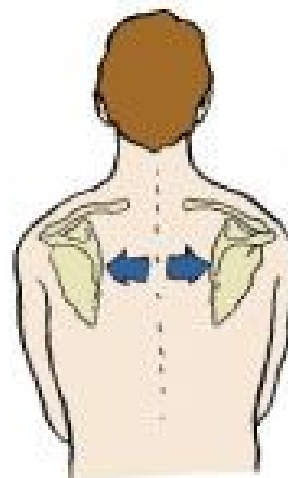
Elevation



Depression



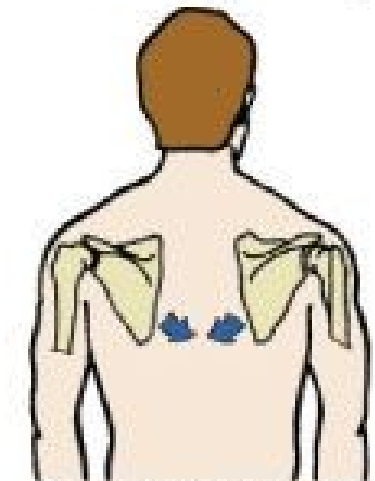
Adduction (retraction)



Abduction (protraction)



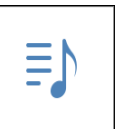
Upward rotation

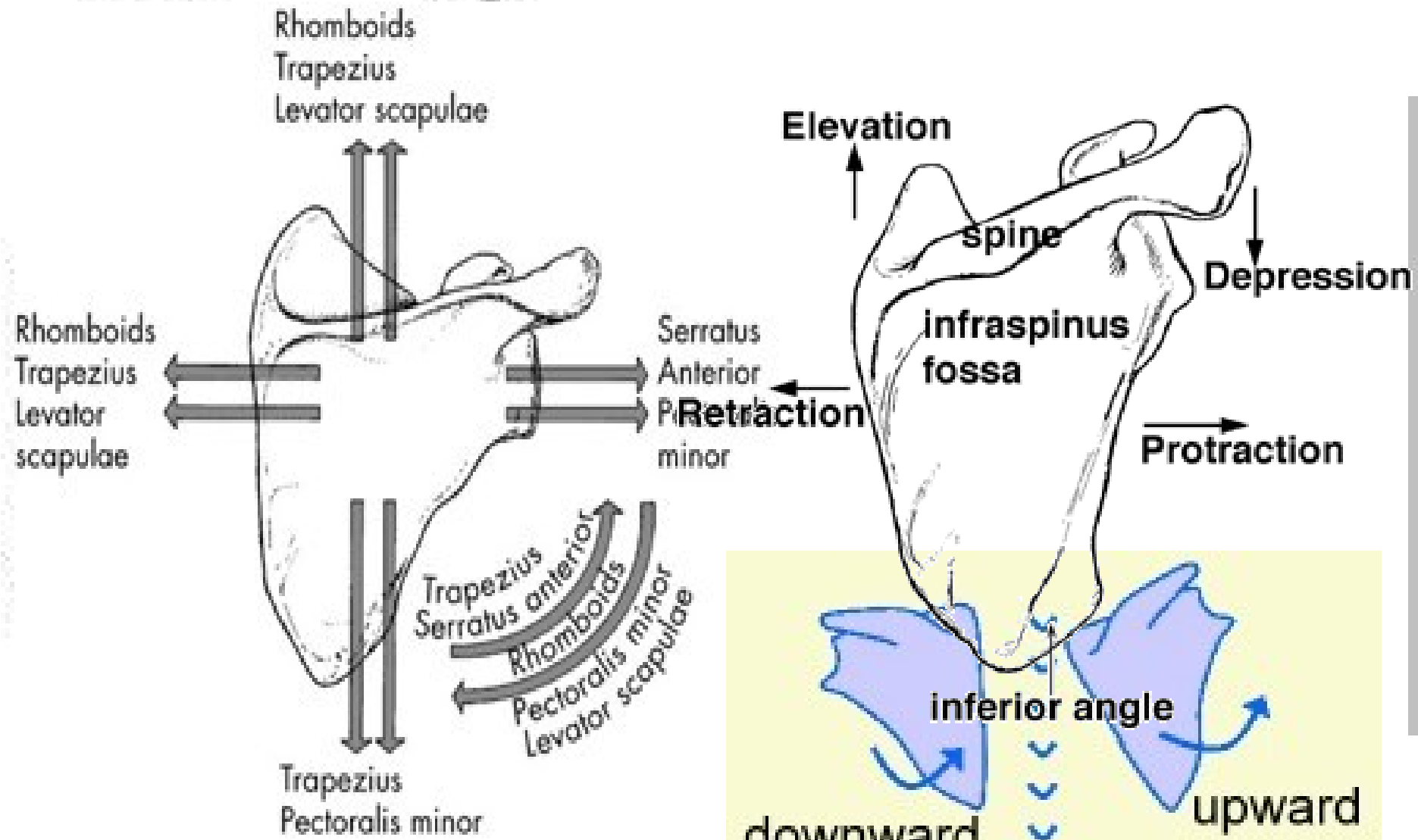


Downward rotation (return to anatomical position)

Scapular movements include

1. **Elevation** □ upper fibers of trapezius & levator scapulae
 2. **Depression** □ pectoralis minor & lower digitations of serratus anterior + gravity
 3. **Protraction** □ pectoralis minor & serratus anterior
 4. **Retraction** □ trapezius & rhomboids
 5. **Rotation up** □ as when you raise the arm above the head by upper fibers of trapezius & lower digitations of serratus anterior
 6. **Rotation down** □ gravity + levator scapulae, rhomboids & pectoralis minor
- ❖ **Subclavius** steadies the clavicle during movements of shoulder girdle





<https://lh3.googleusercontent.com/mvSUIGcNTZ8ThFn6z>

Rotation of
Shoulder Girdle

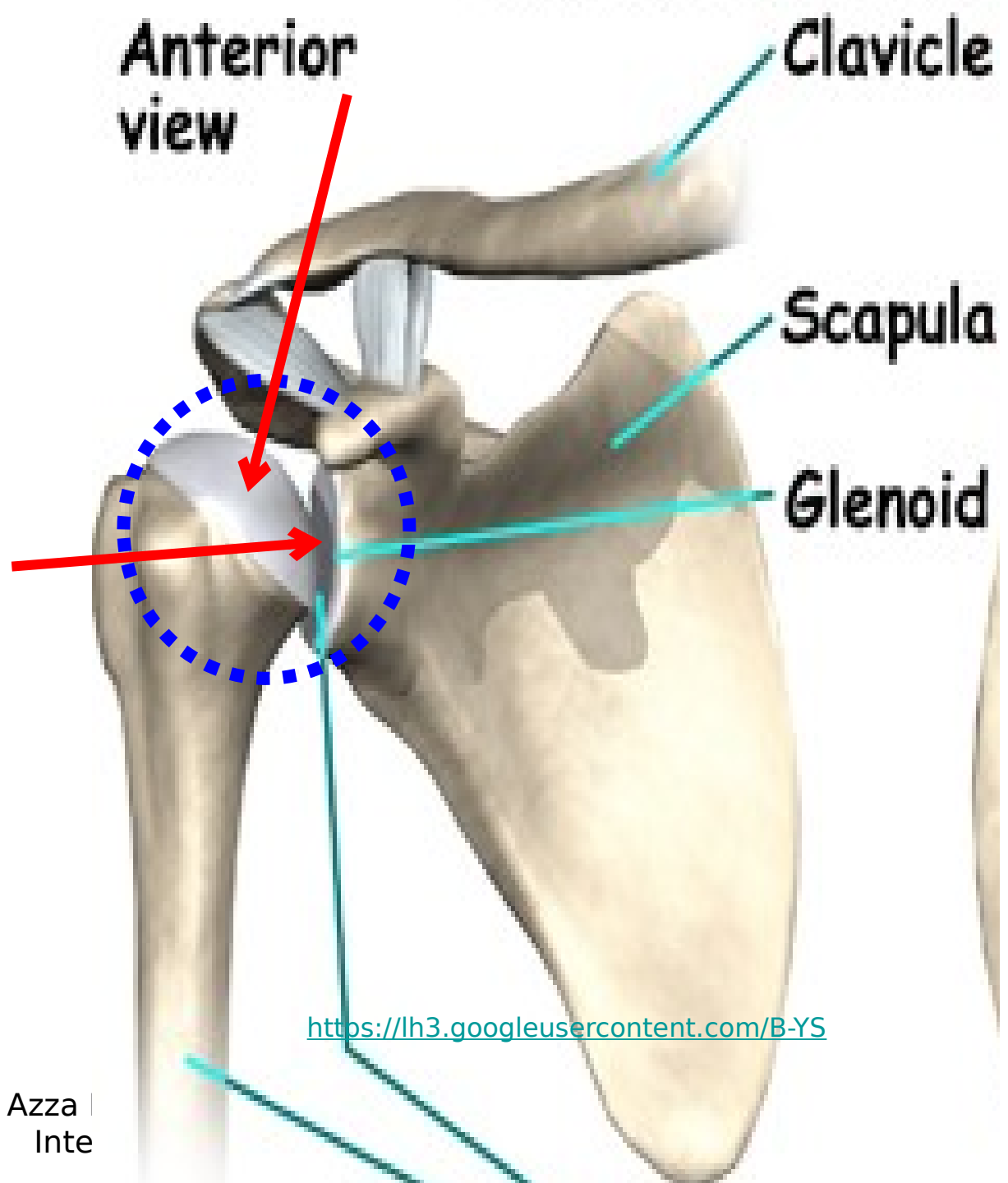
SHOULDER JOINT

❖ Type:

- ❖ Ball & socket synovial joint
- ❖ Multiaxial
- ❖ Most mobile joint in the body

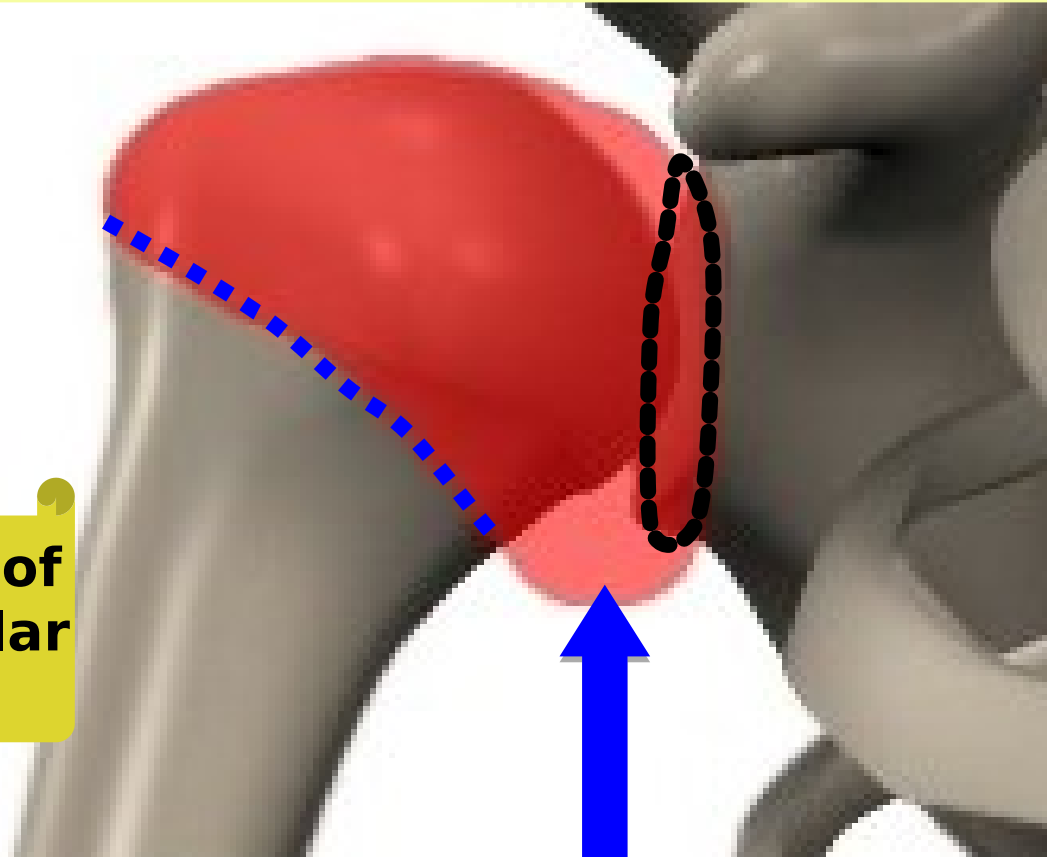
❖ ARTICULAR SURFACES:

- ❖ Head of humerus & glenoid cavity of scapula



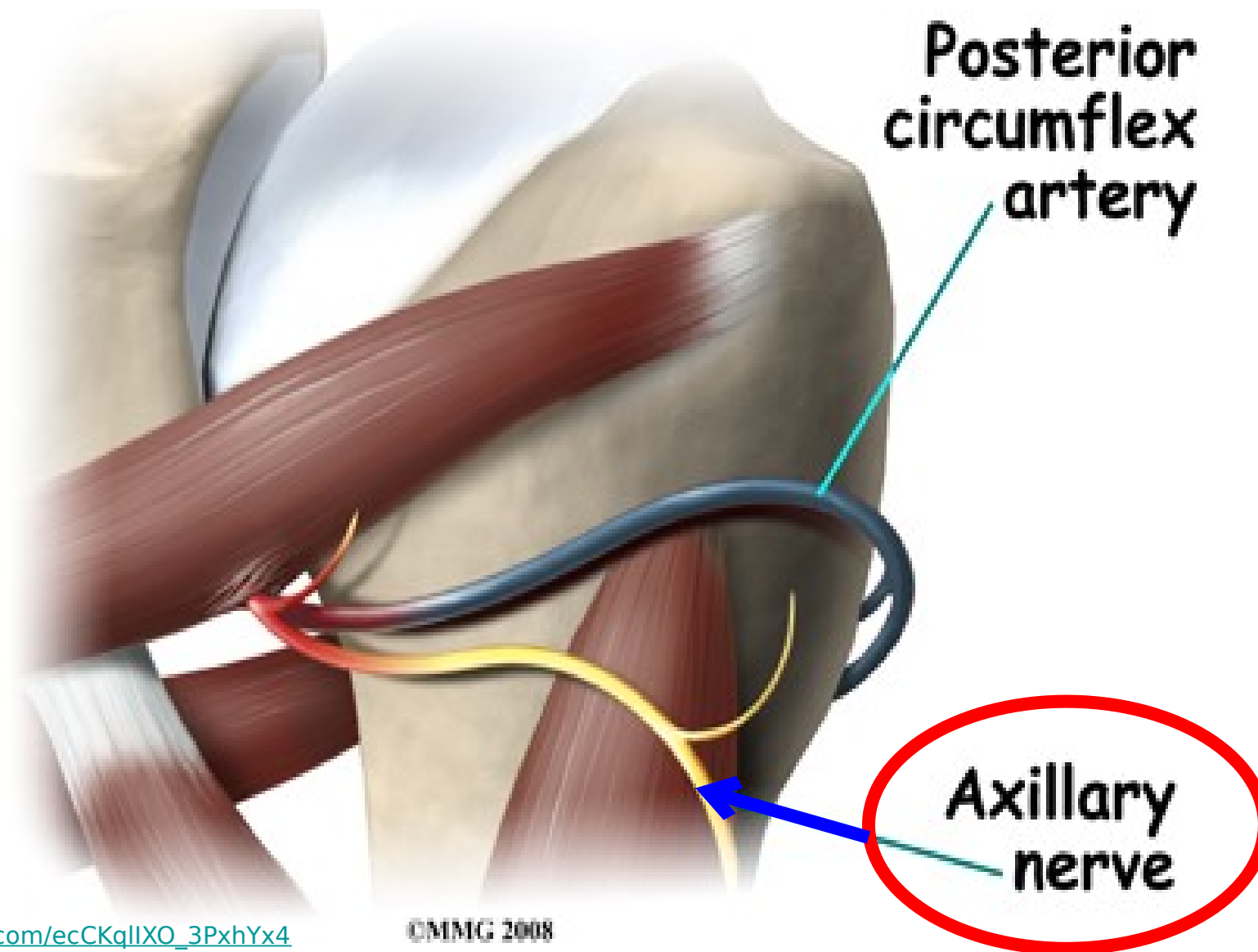
Applied anatomy:

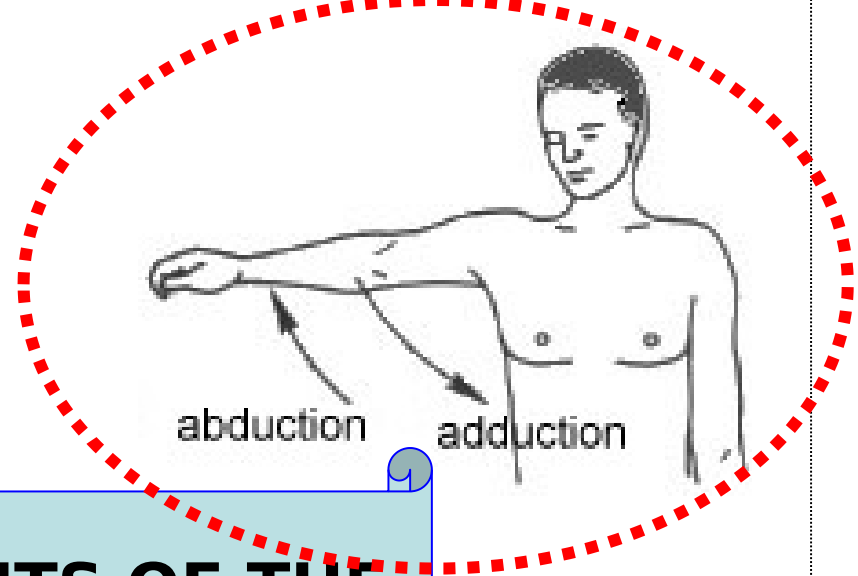
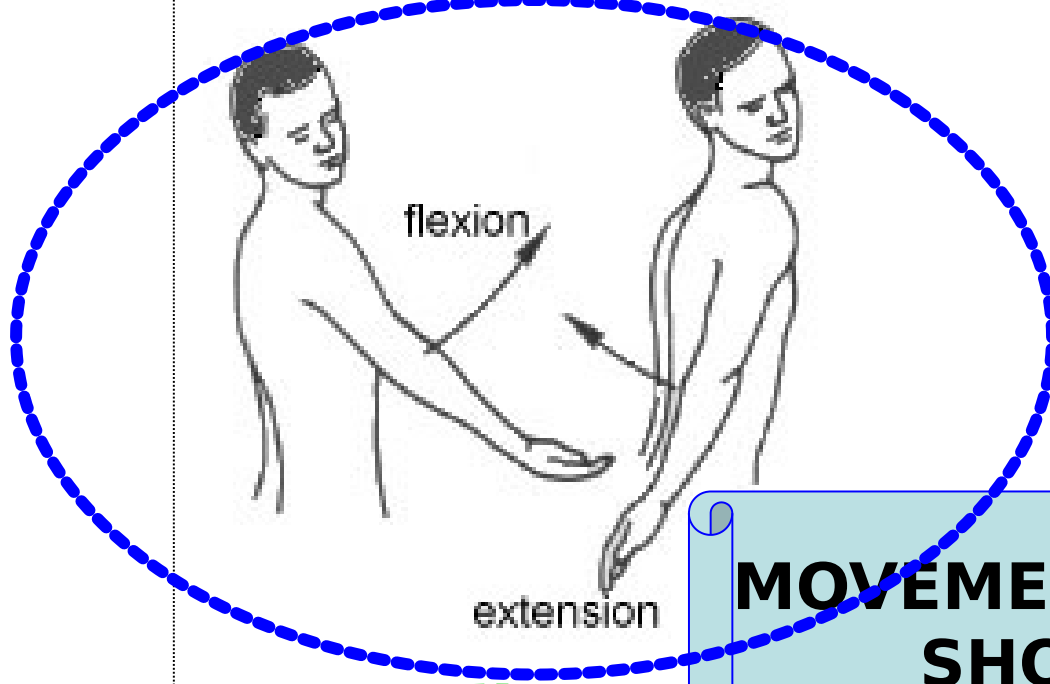
Anteroinferior part of capsule of shoulder joint is the thinnest & least supported specially during abduction where dislocation of shoulder joint frequently occurs. Axillary nerve which passes round the surgical neck of humerus is liable to injury in this position.



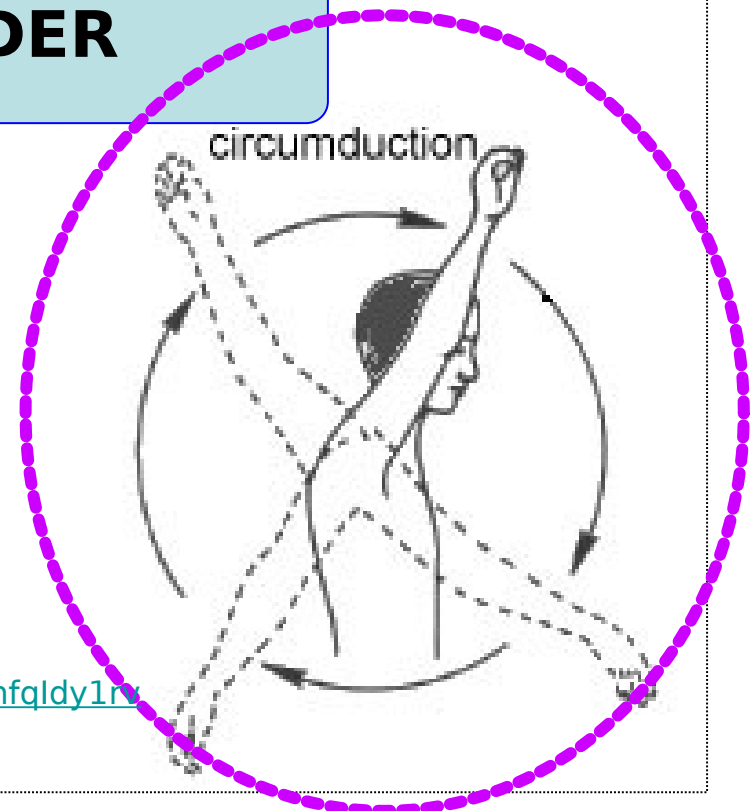
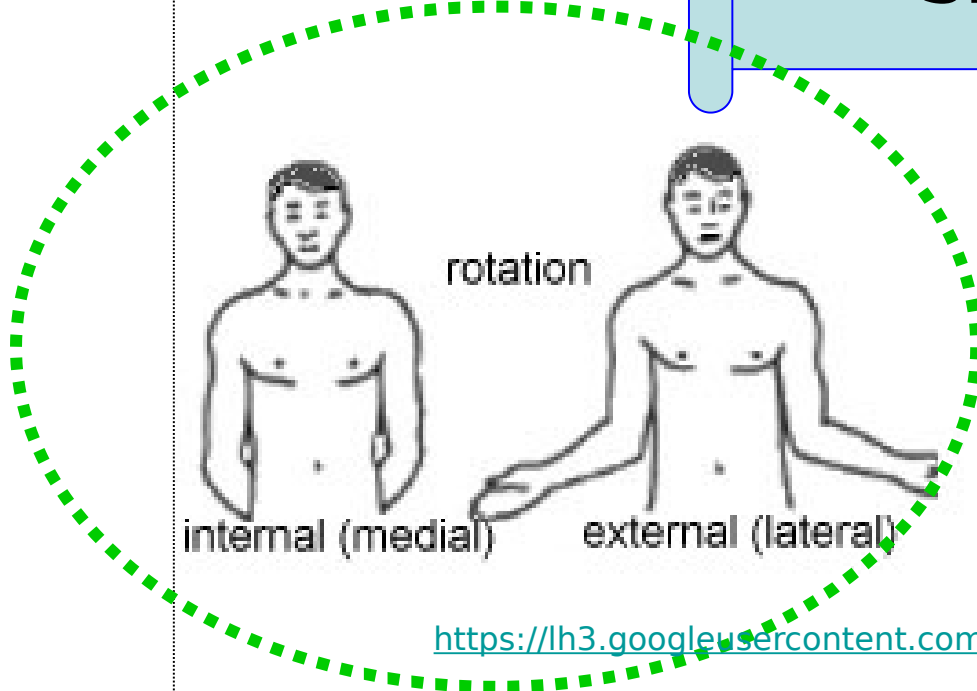
Note the attachment of capsule to the articular margin







MOVEMENTS OF THE SHOULDER



<https://lh3.googleusercontent.com/-gwZCOaYxnfqldy1rv>

Movements of shoulder joint

- **Flexion:** by muscles **anterior** to the joint like **pectoralis major, coracobrachialis** and **anterior fibers of deltoid**.
- **Extension:** by muscles **posterior** to the joint like **latissimus dorsi, teres major** and **posterior fibers of deltoid**.
- **Abduction:** by muscles **superior** to the joint. Movement is **initiated** by **supraspinatus** then **completed** by **deltoid**.



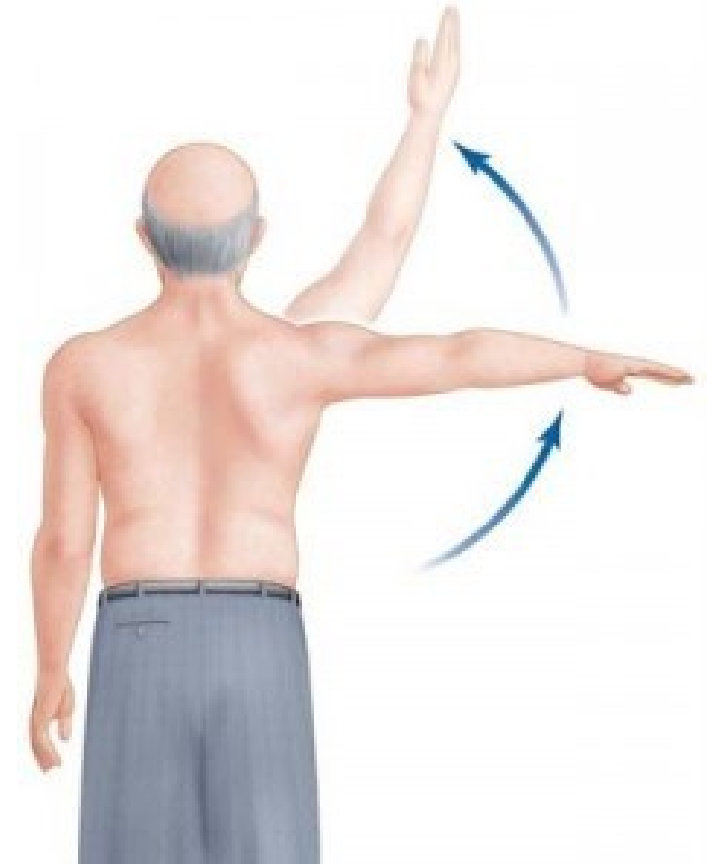
Abduction of the arm:



Supraspinatus \square $0^{\circ} - 15^{\circ}$,
at shoulder joint.

Deltoid (middle fibers) \square
 $15^{\circ} - 90^{\circ}$, at shoulder joint.

**Trapezius & lower
digitations of serratus
anterior** \square $90^{\circ} - 180^{\circ}$,
at shoulder girdle.



<https://lh3.googleusercontent.com/SuNWP1VprCafc89N>



Adduction: by the **two climbing muscles** which are pectoralis major and latissimus dorsi.

Medial rotation: by **muscles inserted into the bicipital groove** which are **pectoralis major, latissimus dorsi and teres major (major-lady-major)** .

Lateral rotation: by **muscles attached to the greater tuberosity** which are

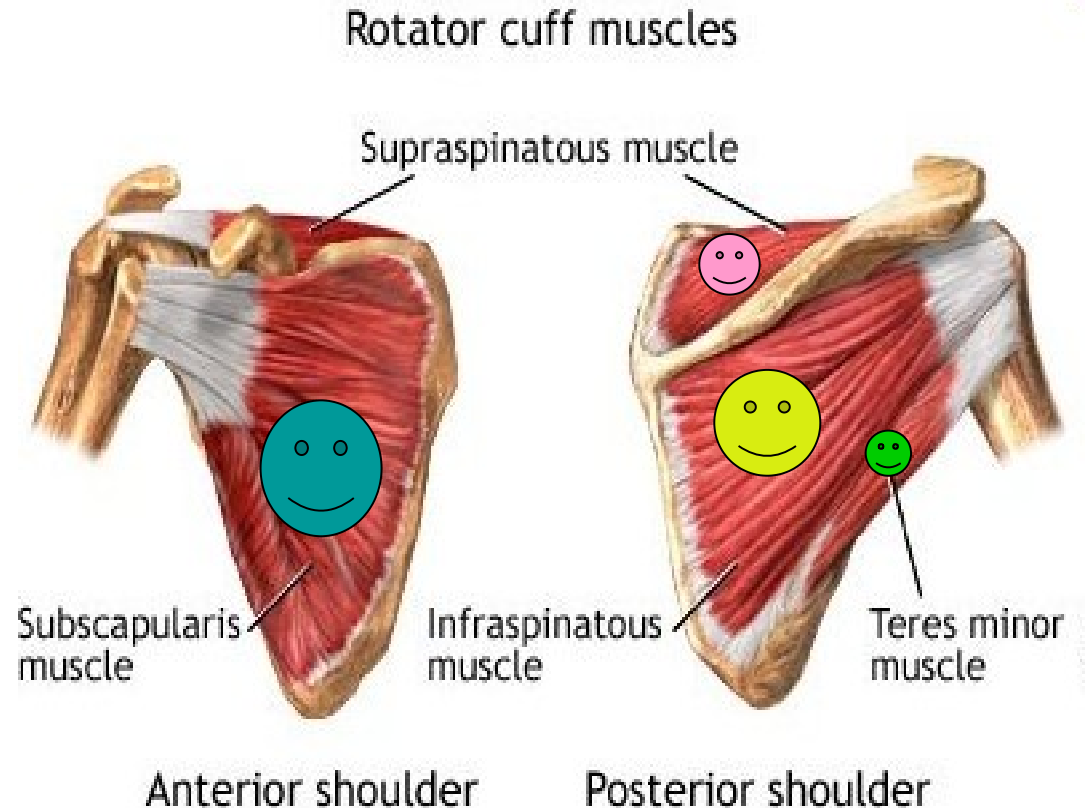
Stability of shoulder joint



- **Shoulder joint is a weak joint from the skeletal point of view.**
- **Its stability depends on the following** (rotator cuff muscles/ coracoacromial arch/long heads of biceps & triceps)

1. Rotator cuff muscles

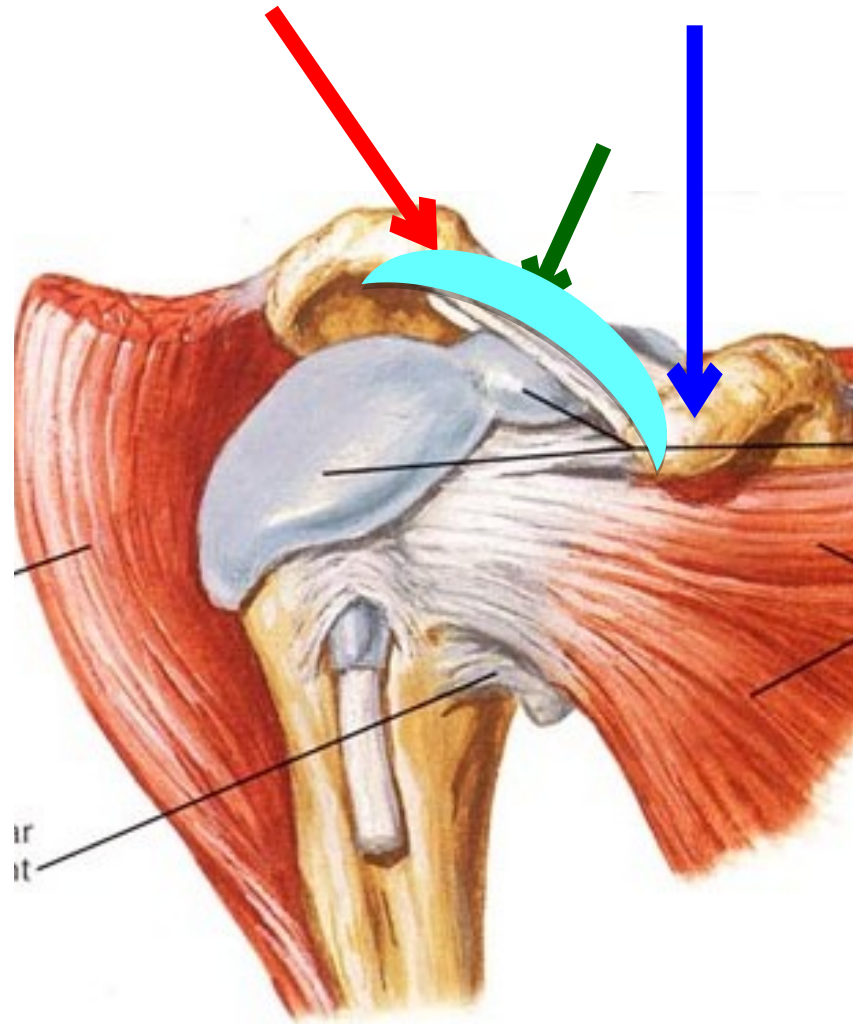
□ supraspinatus/infraspinatus/teres minor & subscapularis, their tendons are adherent to capsule of shoulder joint to help keep head



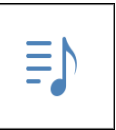
<https://lh3.googleusercontent.com/-ZxUiDt90Xr95FdZ5C5YoFyJOfUxUqGdQoi>

2. Coracoacromial arch:

Coracoid process, acromion process & coracoacromial ligament form an arch over head of humerus acting as a 2nd socket for head of humerus



<https://lh3.googleusercontent.com/QmUaPpLmGZI6Snfy>



The long head of biceps muscle:

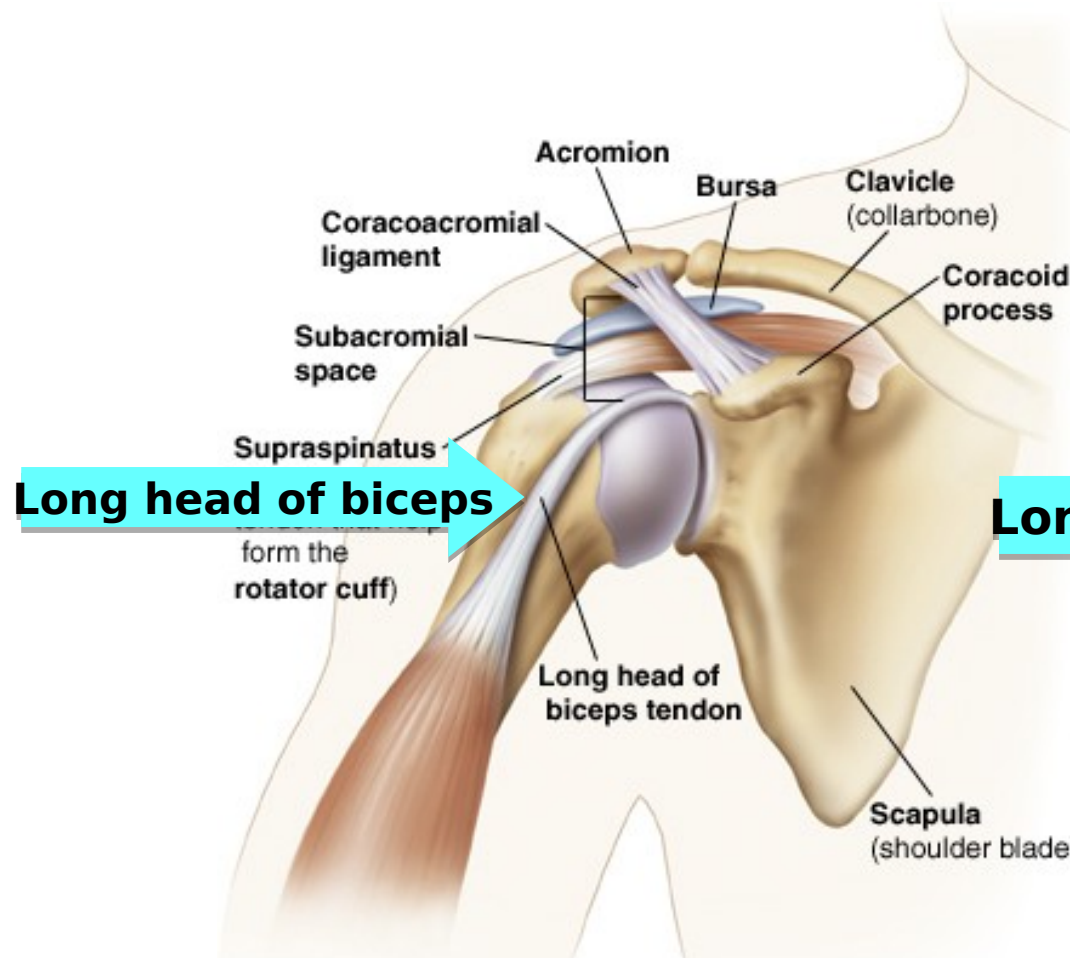
muscle:

Supports the humeral head from **above**.

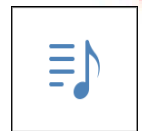
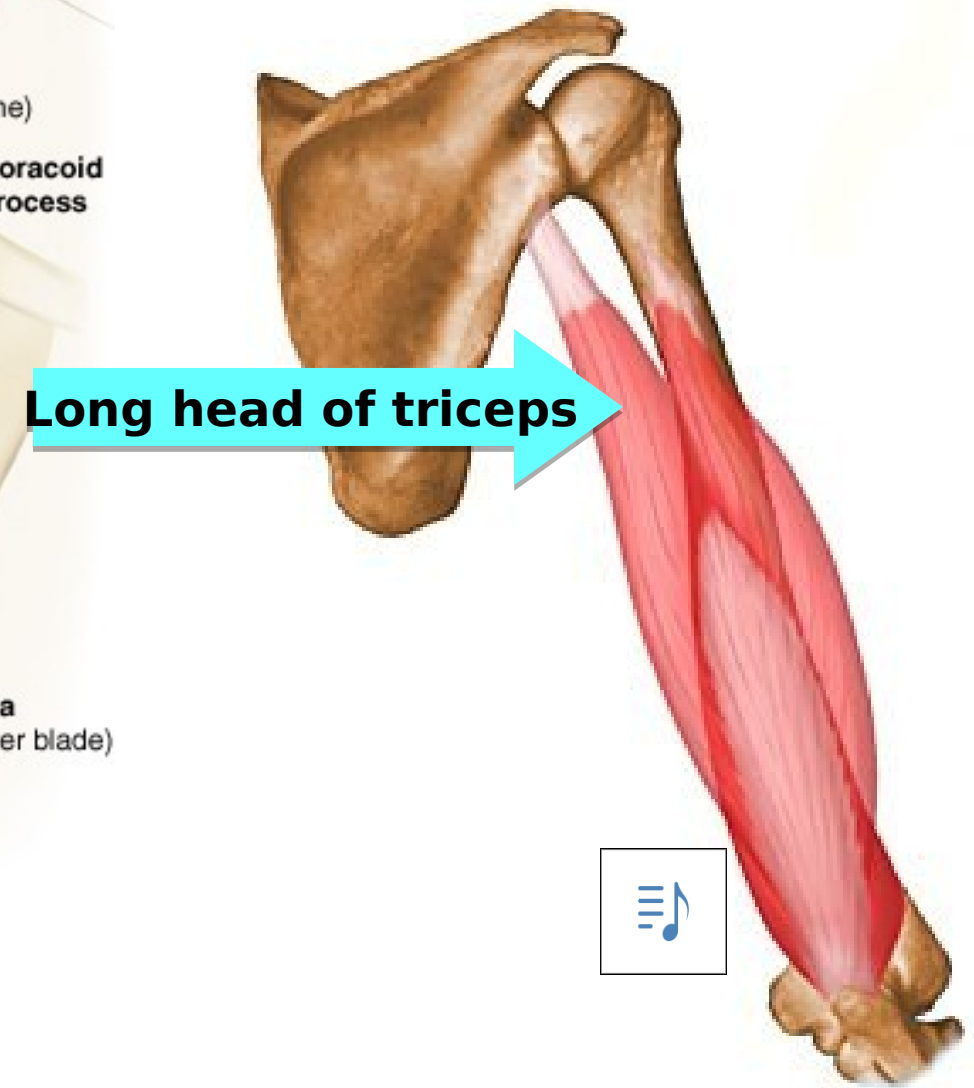
The long head of triceps muscle:

muscle:

Supports the **abducted humerus** from **below** and **this**

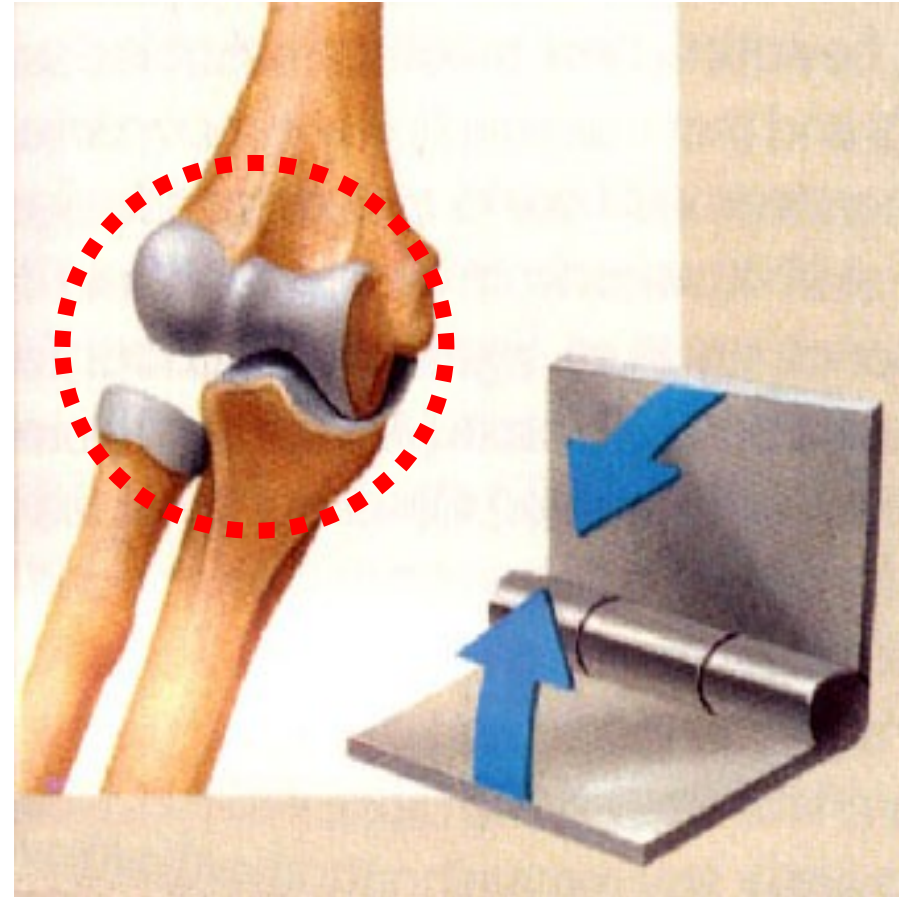
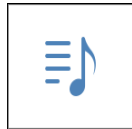


--<https://lh3.googleusercontent.com/ui5FbNKe>

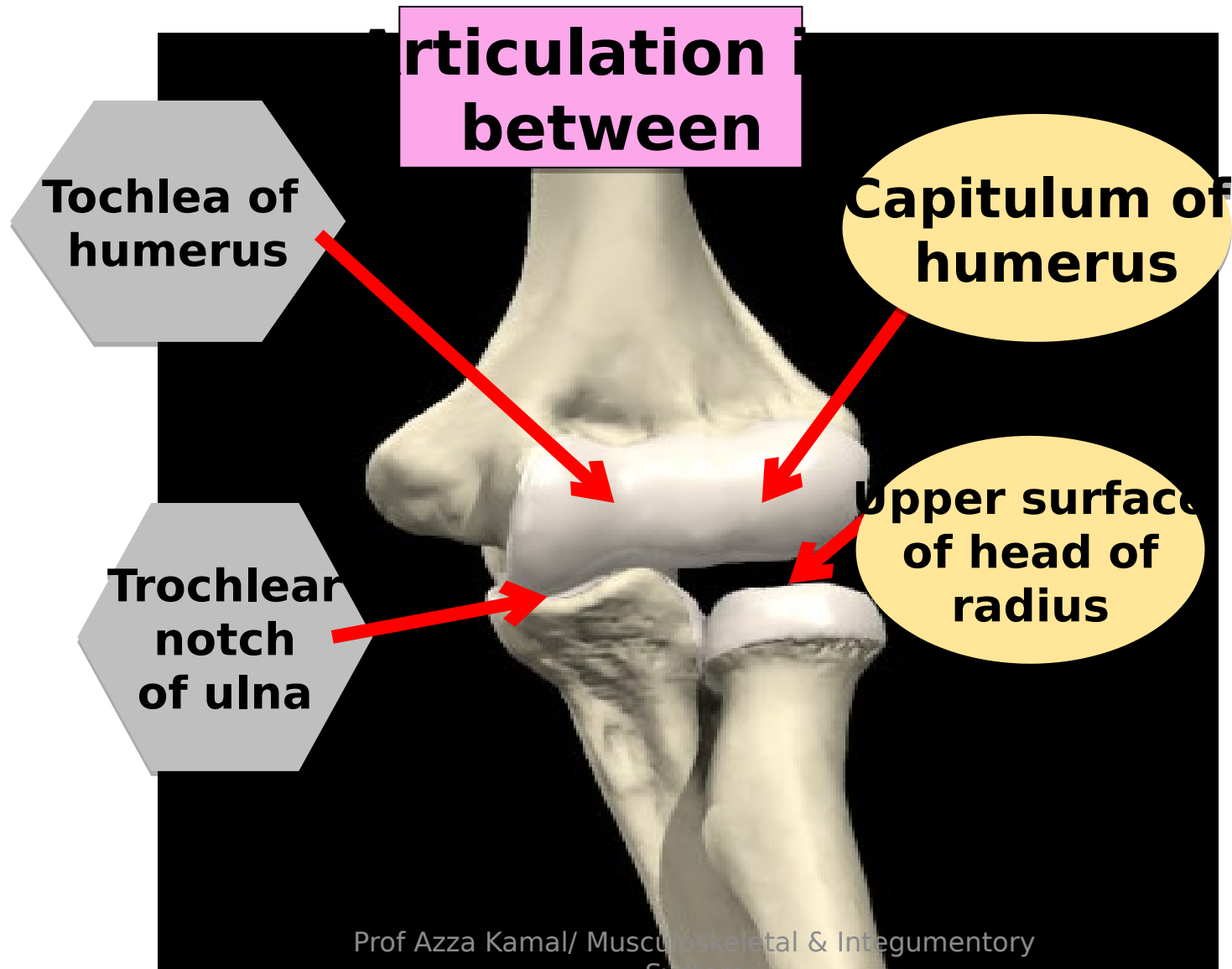


The Elbow Joint

- **Type:**
- **Hinge synovial joint**



<https://lh3.googleusercontent.com/WvFzoRUdZCVyjjwcpa2vL>



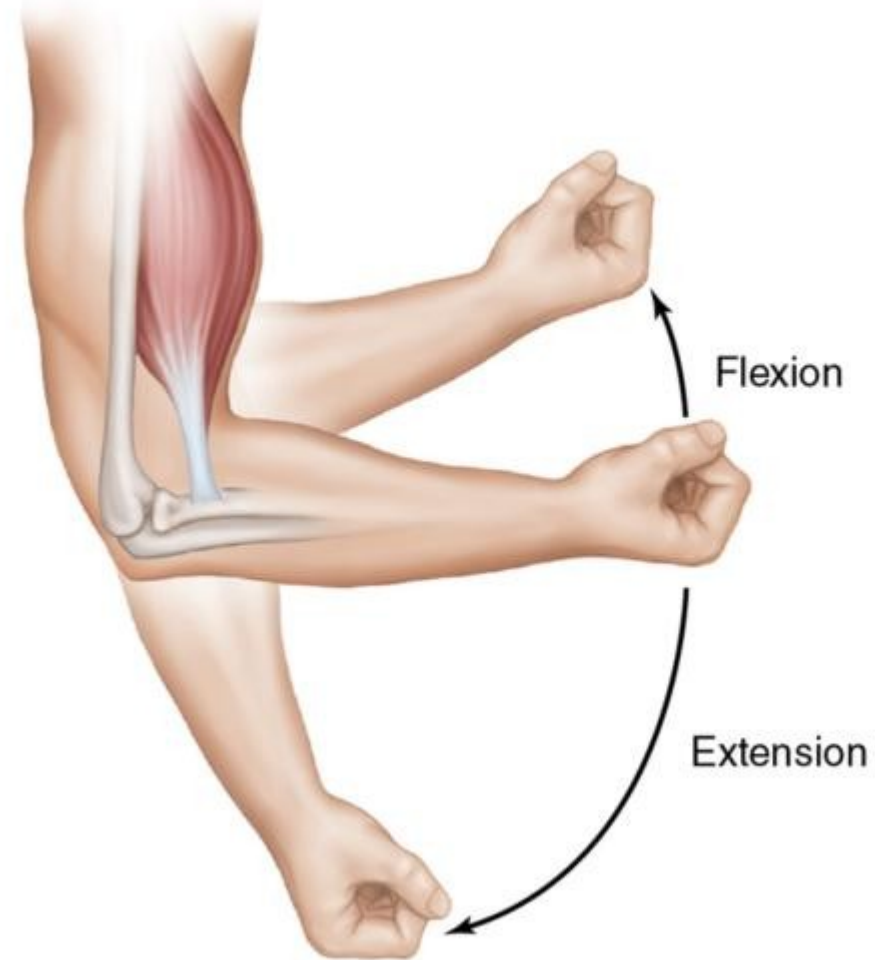
Prof Azza Kamal/ Musculoskeletal & Integumentary

System

<https://lh3.googleusercontent.com/9ze5ACAx5by3lcAsbSvq7E>

Movements of elbow joint

- Uniaxial joint which permits **only flexion & extension**
- **Flexion** is carried by □ biceps, brachialis & brachioradialis
- **Extension** is carried by □ triceps & anconeus

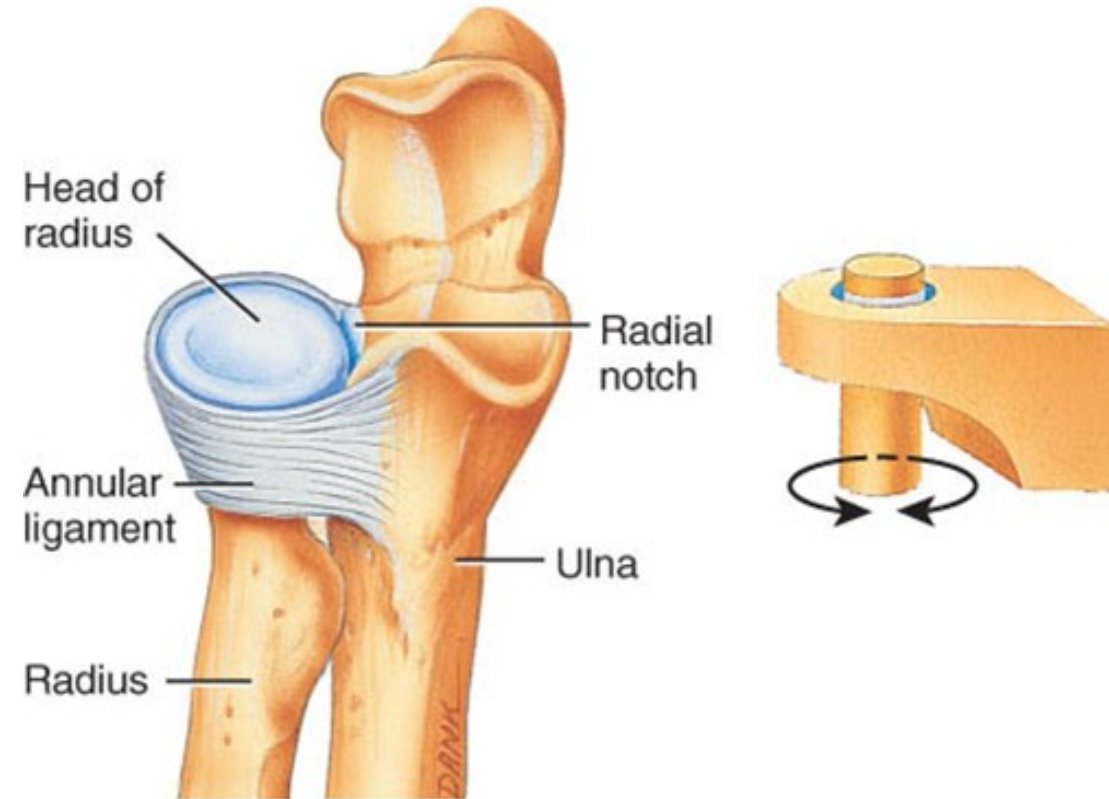
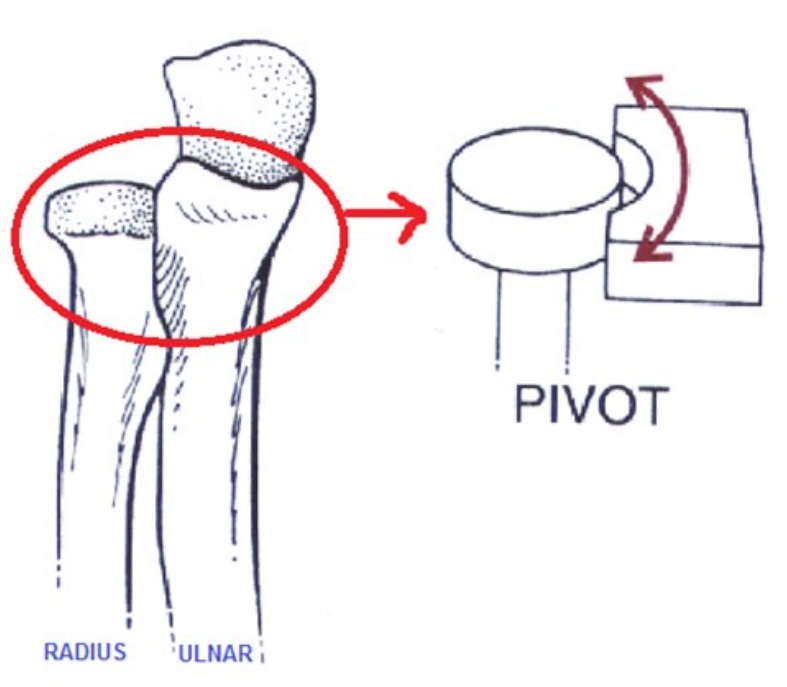


<https://lh3.googleusercontent.com/shN4xraT0LDcQsuA9D20JT>

Superior radioulnar joint



• **Type :**
Pivot synovial
joint



https://lh3.googleusercontent.com/L2KmBKA5frW7PV4e_Fq

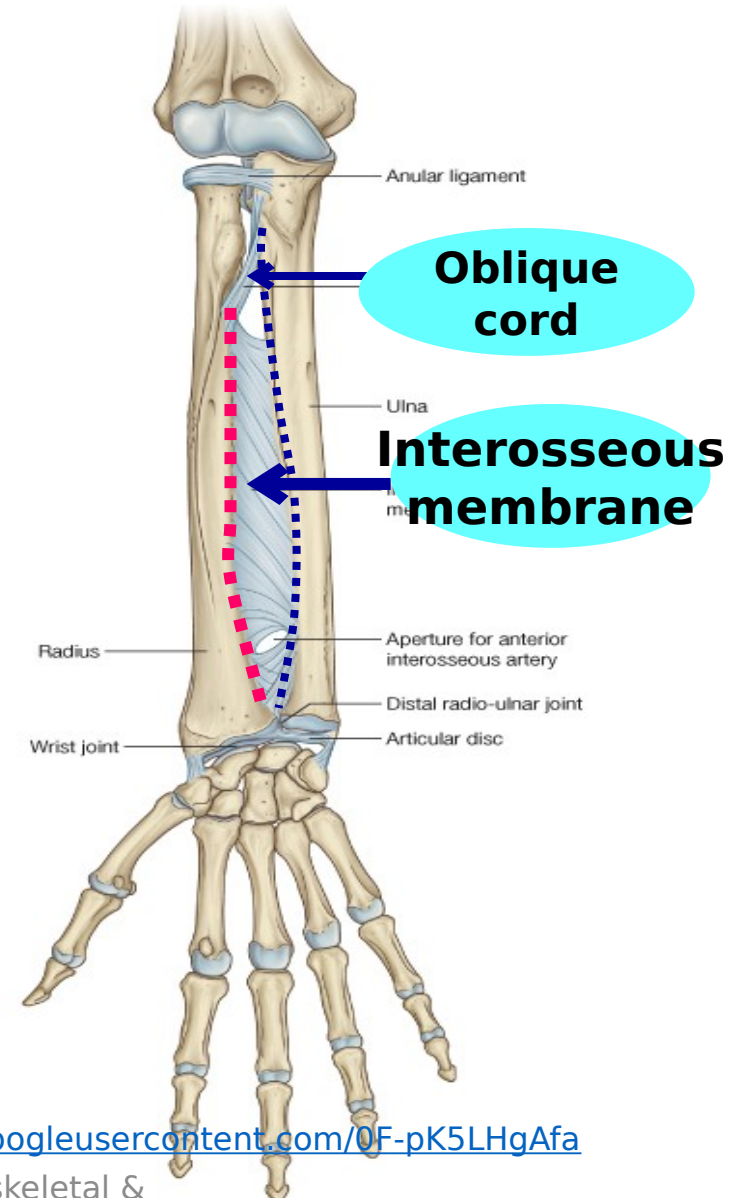
(c) Pivot joint between head of radius and radial notch of ulna

<https://lh3.googleusercontent.com/THn5qMCXt1CU15XL9TYn>

Middle radioulnar joint



- **Type: fibrous joint (syndesmosis)** between radius & ulna.
- Formed by oblique cord & interosseous membrane which connect the interosseous borders of radius & ulna

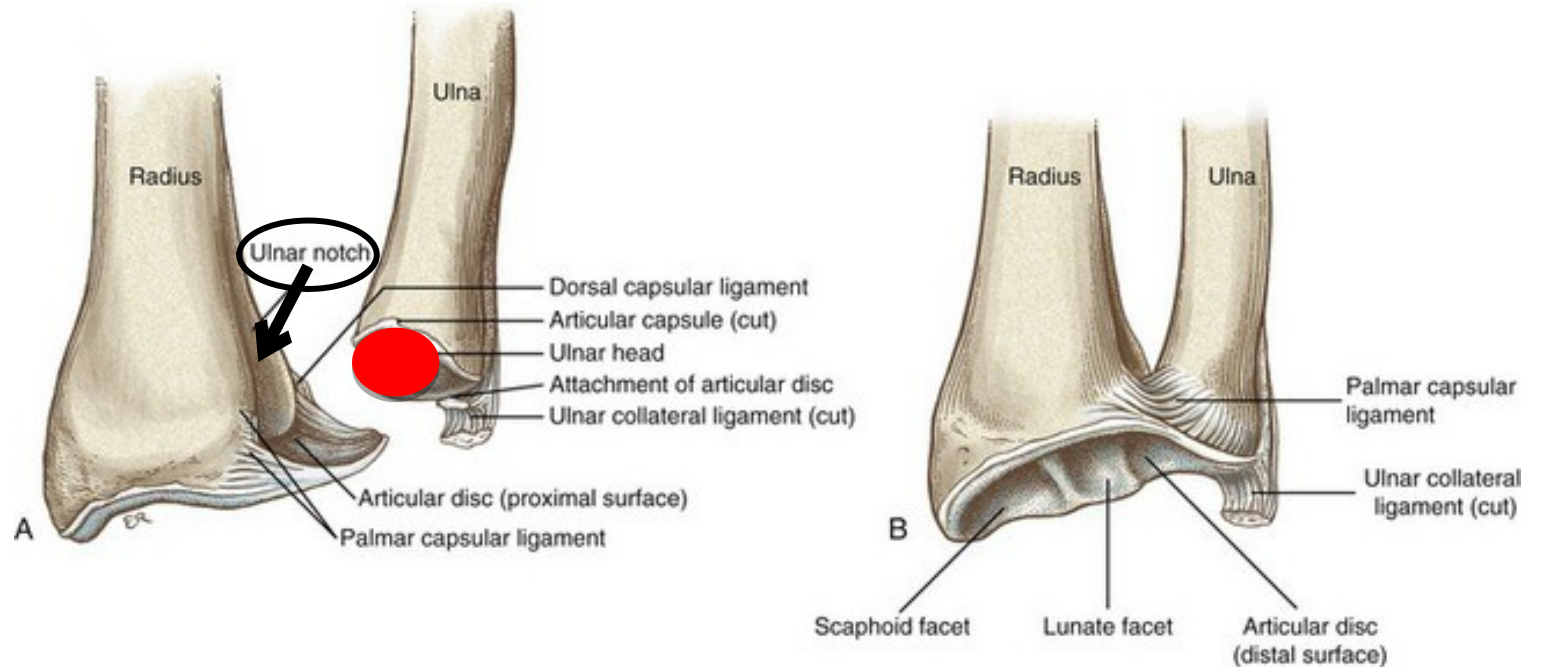


<https://lh3.googleusercontent.com/0F-pK5LHgAfa>

Inferior radioulnar joint



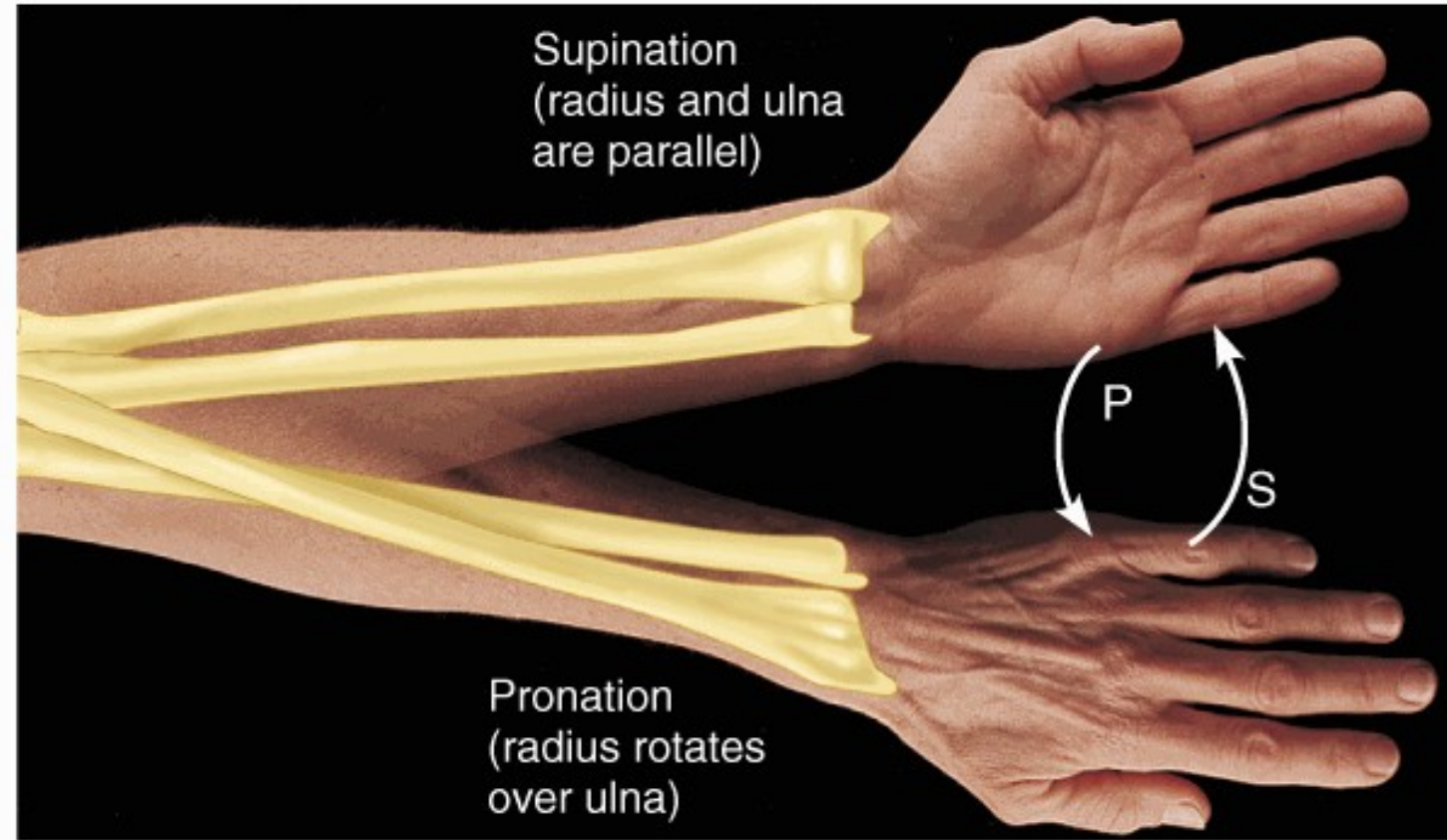
- **Type:** pivot synovial joint
- **Articulating surfaces:** head of ulna & ulnar notch of radius



<https://lh3.googleusercontent.com/zv6hvXnwNpvM9O1laaW>

Movements of radioulnar joints

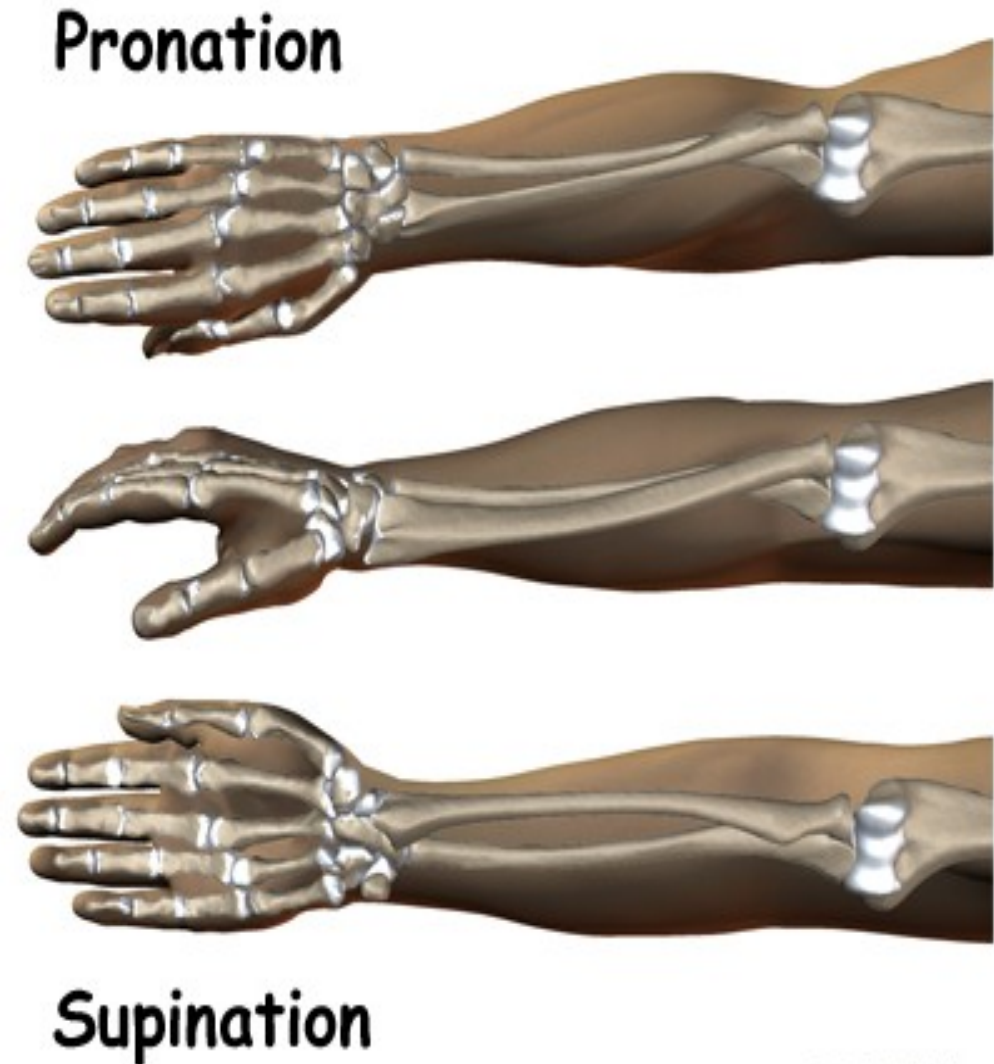
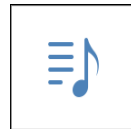
- ❑ **Pronation** done by pronator teres & pronator quadratus
- ❑ **Supination** done by
 - * Supinator in extended elbow
 - * Biceps in flexed elbow
 - * Brachioradialis initiates both pronation & supination



<https://lh3.googleusercontent.com/pXNjSgsSV29nyX>

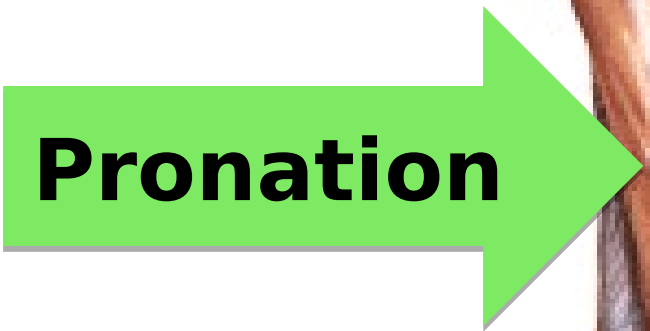
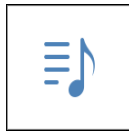


- During pronation & supination the **radius** is the **movable bone** while the **ulna** is relatively stationary.



©MMG 2004

<https://lh3.googleusercontent.com/bdmO2hSrhU4wIn13c>



Pronation



During **pronation** □ Radius crosses the ulna like the letter X



Supination



During **supination** □ Radius goes back parallel to ulna

*Frank H. Netter
Atlas of Human Anatomy
6th edition*

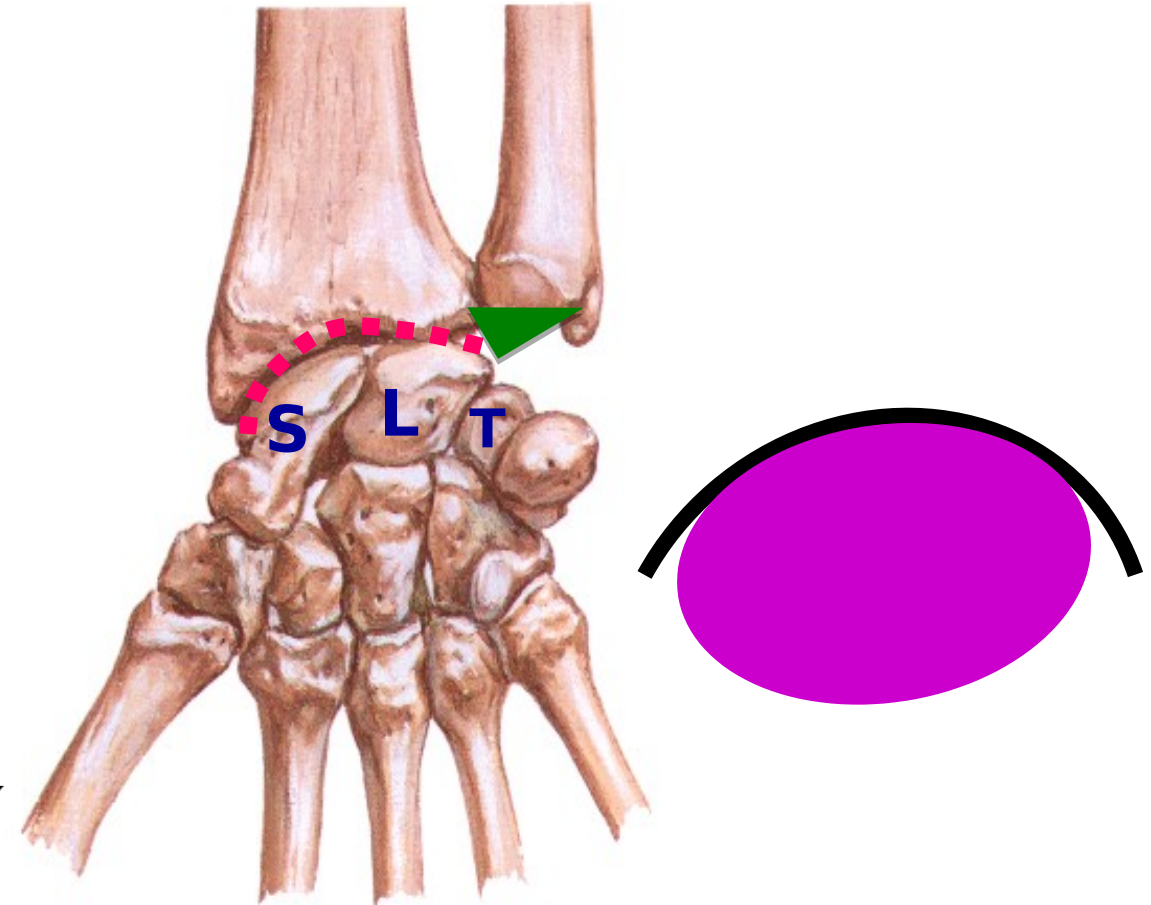
al/ Musculoskeletal &
entory System



The Wrist Joint

- **Type** : ellipsoid synovial joint
- **Articulating surfaces**:
- **Superior** □ inferior surface of distal end of radius & inf. surface of **articular cartilage**
- **Inferior** □ proximal surface of **s**caphoid, **l**unate & **t**riquetral bones

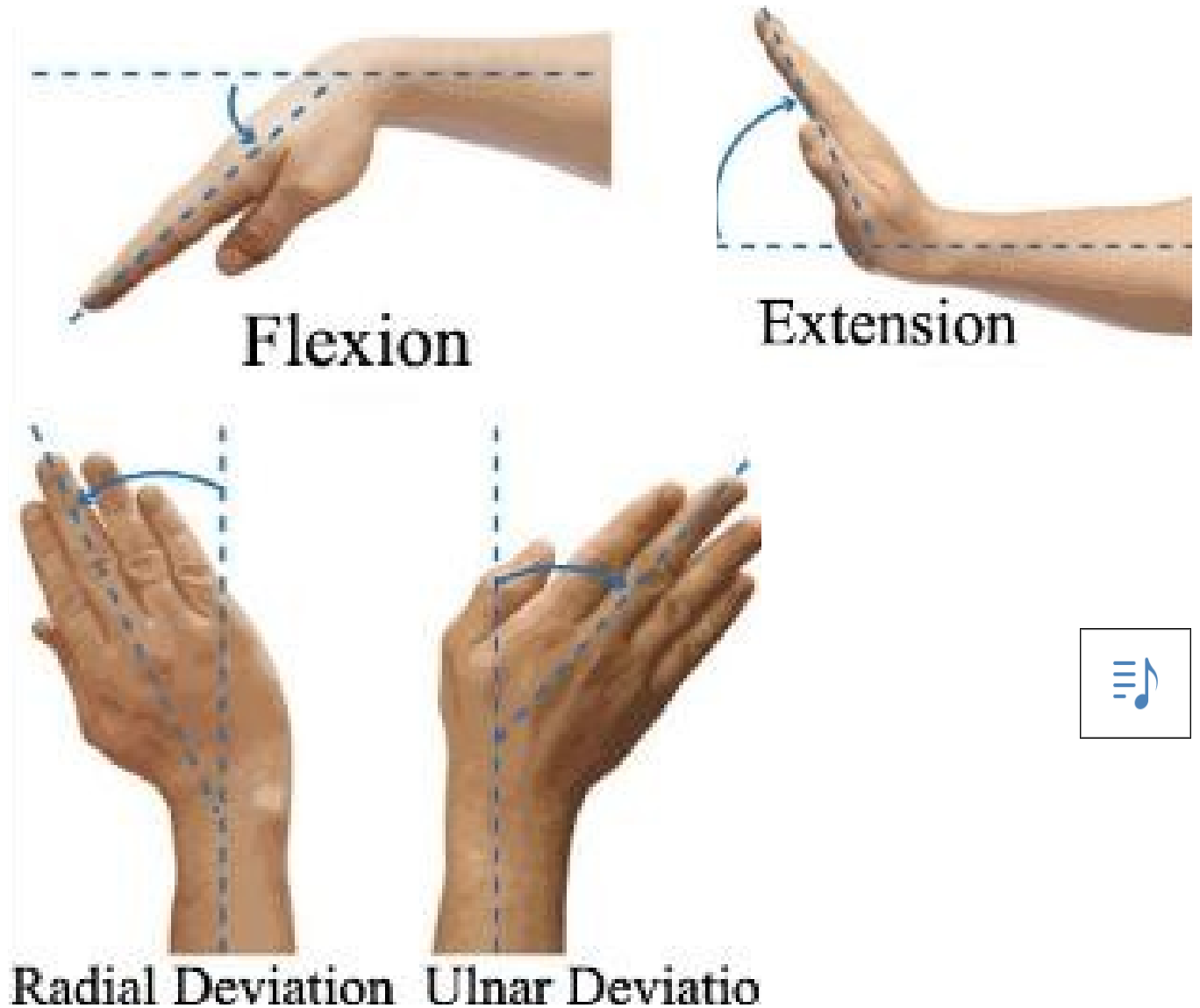
Radiocarpal joint



Frank H. Netter
Atlas of Human Anatomy
6th edition

Movements of wrist joint

- Flexion by ?
- Extension by ?
- Abduction by ?
- Adduction by ?
- Circumduction ?



<https://lh3.googleusercontent.com/H5hXanGETuyqft14nijQNx>

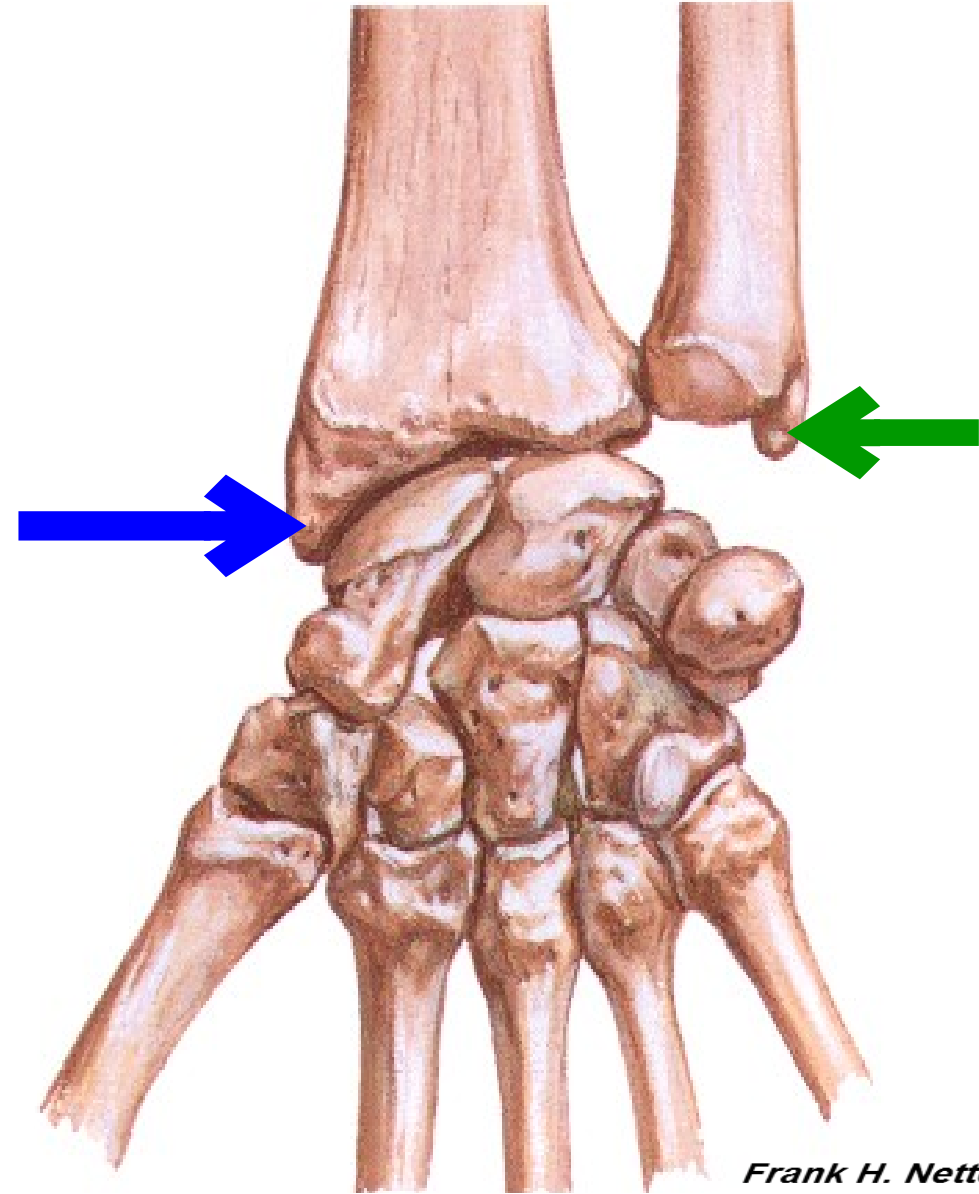
Movement	Muscle producing it
Flexion	Flexor carpi radialis, flexor carpi ulnaris, palmaris longus, flexor digitorum superficialis, flexor digitorum profundus, flexor pollicis longus
Extension	Extensor carpi radialis longus & brevis, extensor carpi ulnaris, extensor digitorum, extensor digiti minimi, extensor indicis & extensor pollicis longus
Adduction	Flexor carpi ulnaris & extensor carpi ulnaris
Abduction	Flexor carpi radialis & extensor carpi radialis longus & brevis
Circumduction	Combination of extension, abduction, flexion & adduction done in succession



- Is the range of adduction of the hand at the wrist greater or lesser than the range of abduction and **WHY???**

- **ADDUCTION IS GREATER THAN ABDUCTION**

- Because the styloid process of radius is lower than the styloid process of ulna **limiting abduction.**

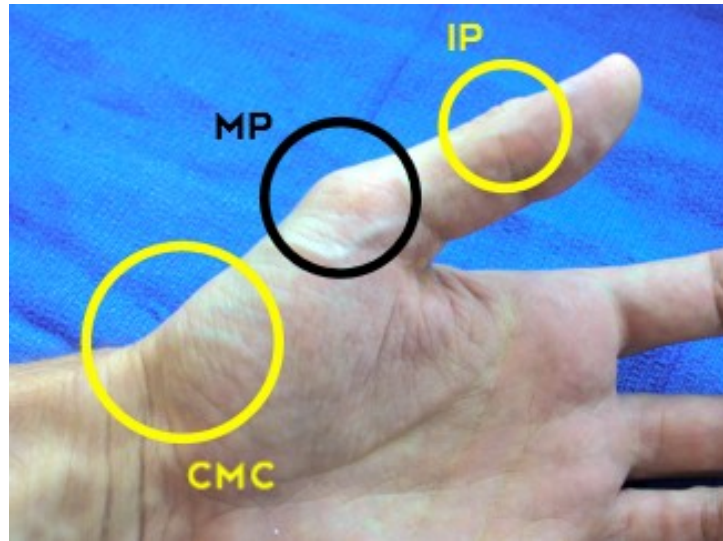


*Frank H. Netter
Atlas of Human Anatomy
6th edition*

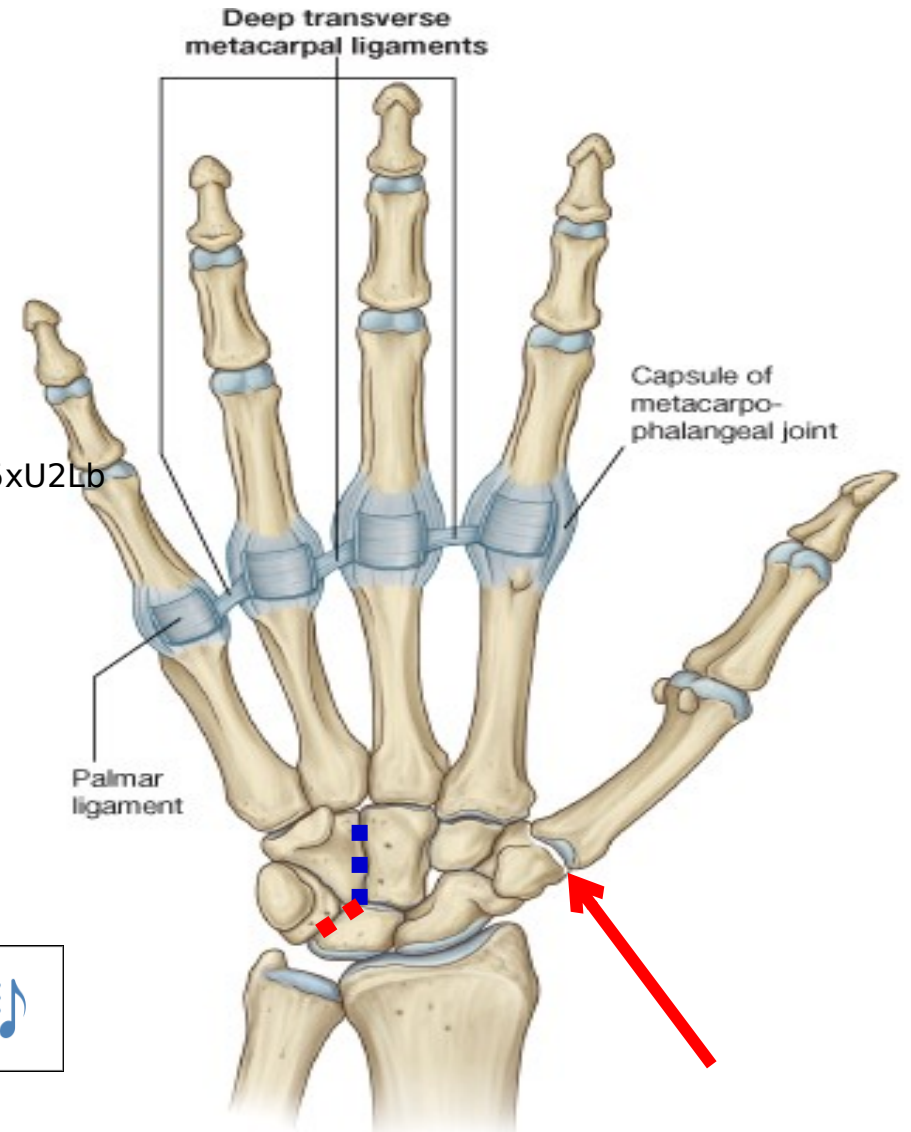


- Intercarpal joints □ plane synovial

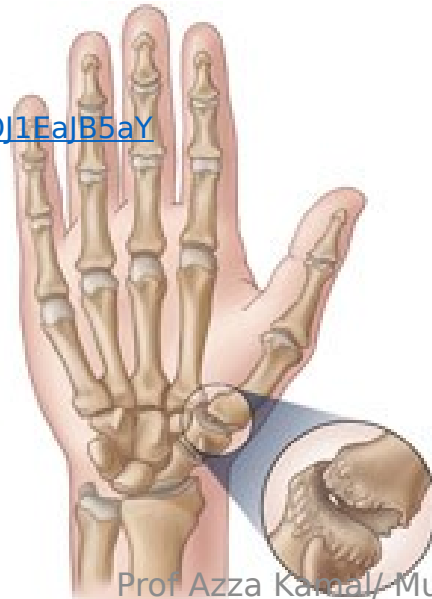
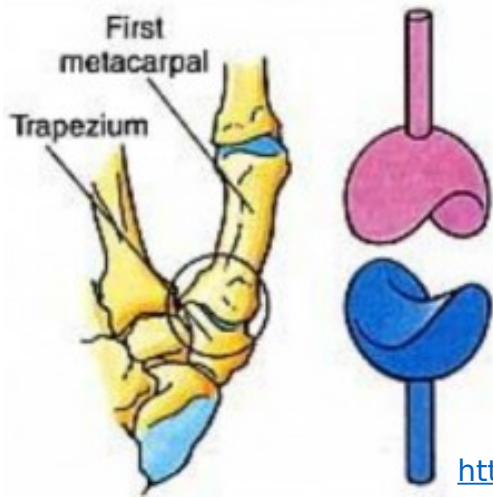
- Carpometacarpal joint of thumb □ synovial saddle □ between trapezium & base of 1st



https://lh3.googleusercontent.com/eJBcdKaJ_liqXwllxw5xU2Lb

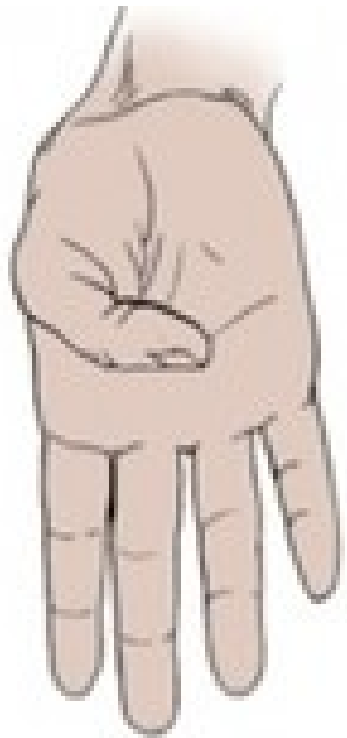


<https://lh3.googleusercontent.com/m4xWtEu4FHX4P0AY5AE6>



Prof Azza Kamal/ Musculoskeletal & Integumentary System

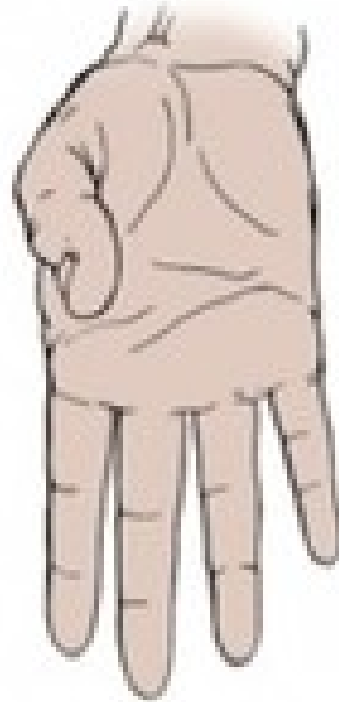
https://lh3.googleusercontent.com/OiLXJ_hwGteK8ZR1sPT_



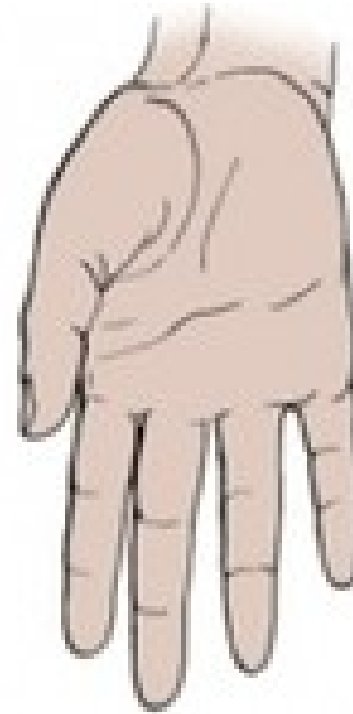
Flexion



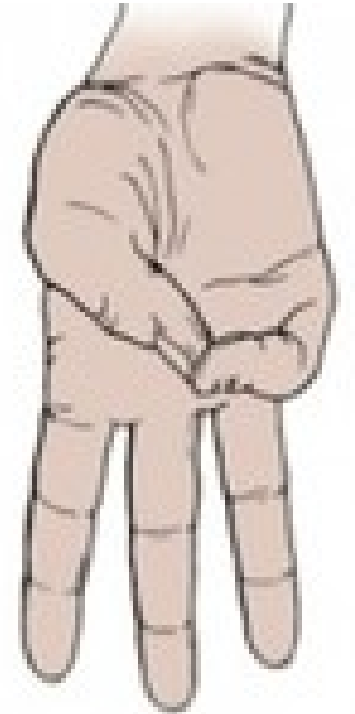
Extension



Abduction



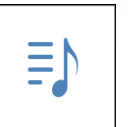
Adduction



Opposition

Movements of thumb

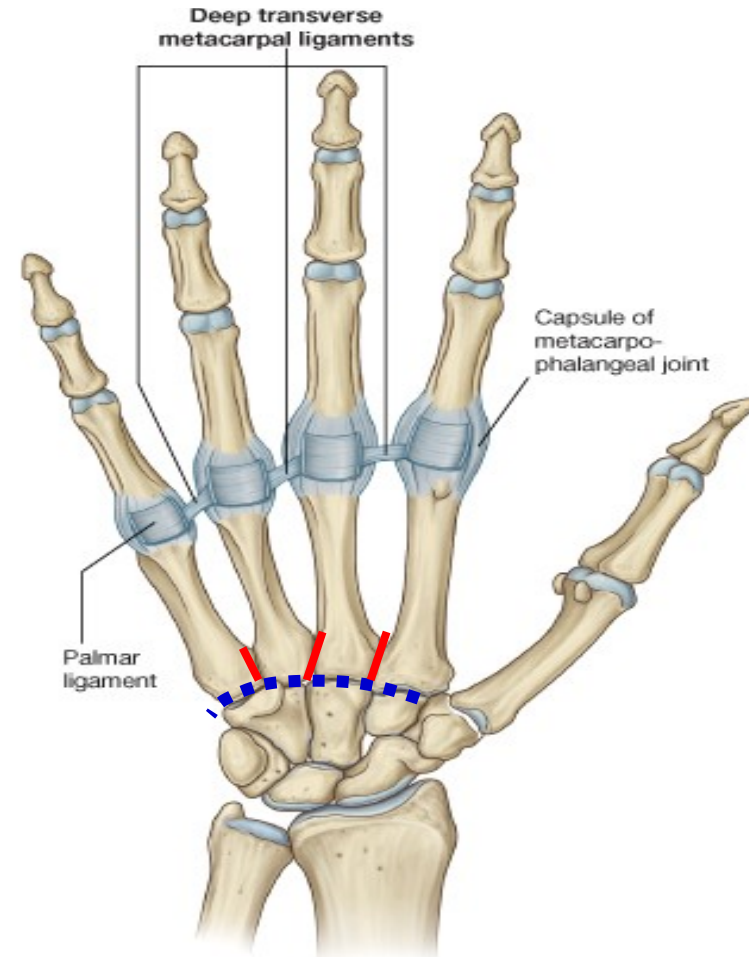
https://lh3.googleusercontent.com/RoVWP_NZ9



Movements of Thumb	Muscles producing them
Flexion	Flexor pollicis longus & brevis, opponens pollicis
Extension	Extensor pollicis longus & brevis, abductor pollicis longus
Abduction	Abductor pollicis longus & brevis
Adduction	Adductor pollicis
Opposition	Opponens pollicis & flexor



- **Carpometacarpal joints of medial 4 fingers**
- **Type:** plane synovial joints
- **Intermetacarpal joints** between bases of 2nd, 3rd, 4th, 5th metacarpals
□ plane synovial

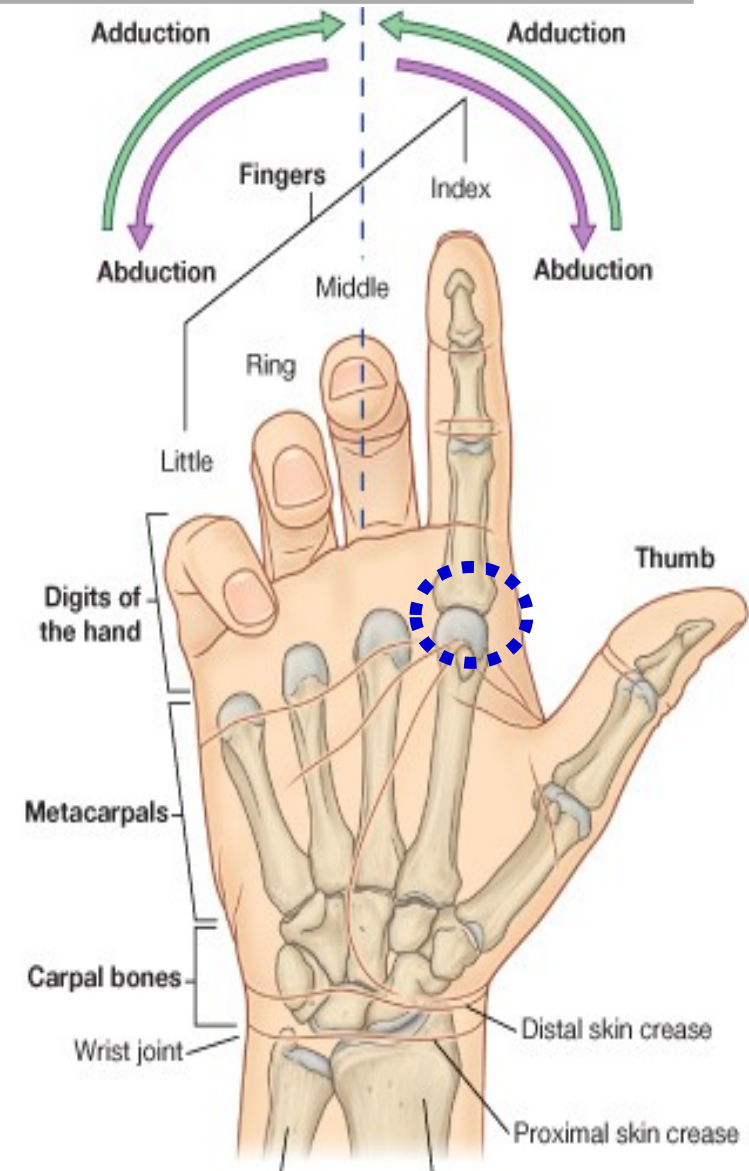
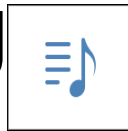


<https://lh3.googleusercontent.com/m4xWtEu4FHX4P0AY5AE6>



Metacarpophalangeal joints

- **Type:**
- **ellipsoid synovial joints**
- **Between heads of metacarpals & proximal phalange**



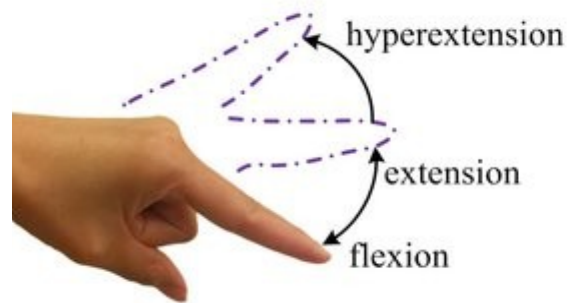
•Movements of metacarpophalangeal joints :

- Flexion** □ flexor digitorum superficialis & profundus

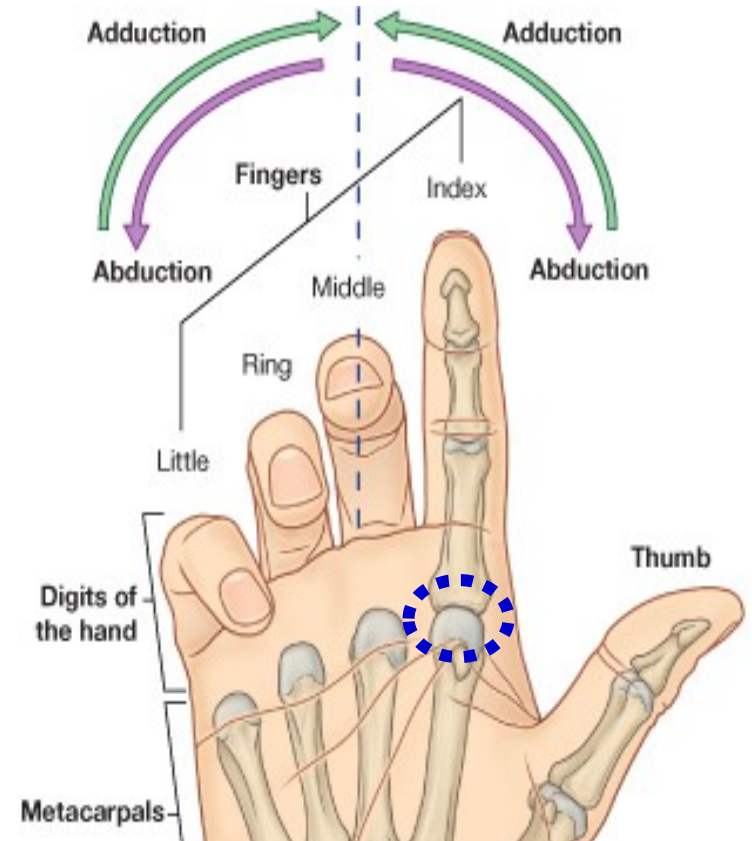
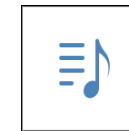
- Extension** □ extensor digitorum, extensor indicis & ext digiti minimi

- Adduction** □ palmar interossei (**PAD**)

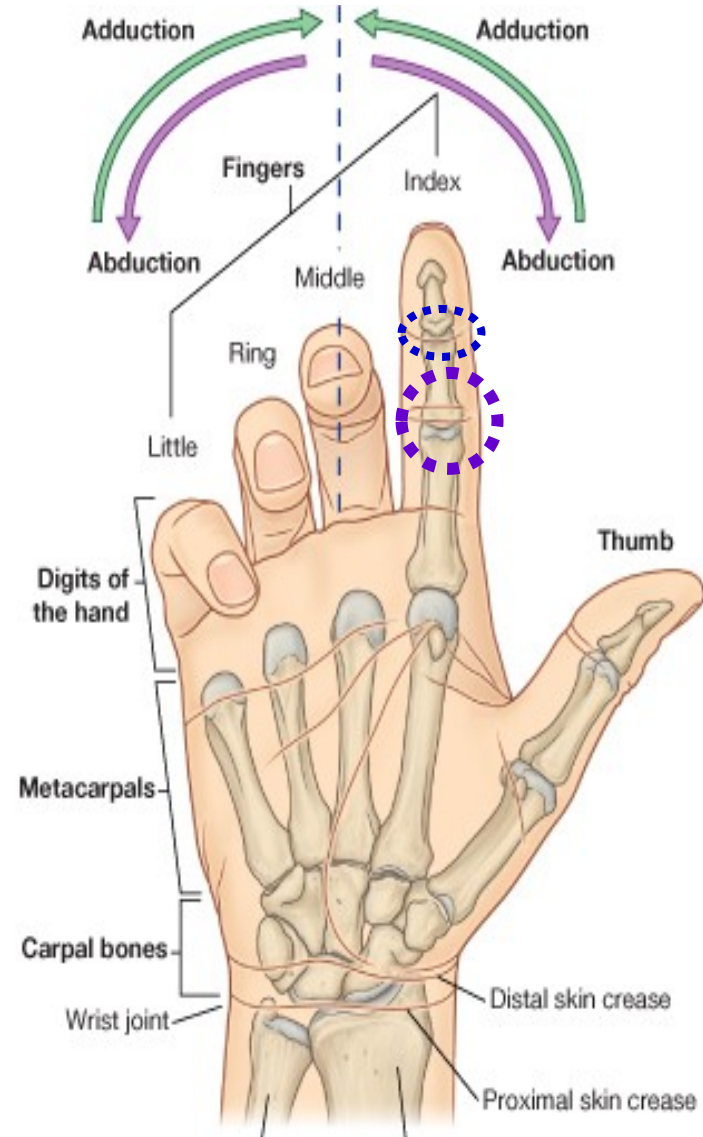
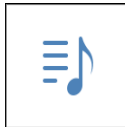
- Abduction** □ dorsal interossei (**DAP**)



<https://lh3.googleusercontent.com/E7DP6MHZ-5>

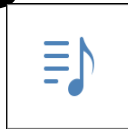


- **Proximal & distal interphalangeal joints**
- **Type:** synovial hinge
- **Movements:**
- **Flexion** □ **FDS & FDP**
- **Extension** □ **ext digitorum, ext indicis & ext digiti minimi**



<https://lh3.googleusercontent.com/E7DP6MHZ->

- Lumbricals & interossei, put the fingers in **the writing position**
□ flexion of metacarpophalangeal joints & extension of interphalangeal joints



Extension of
Interphalangeal
joints

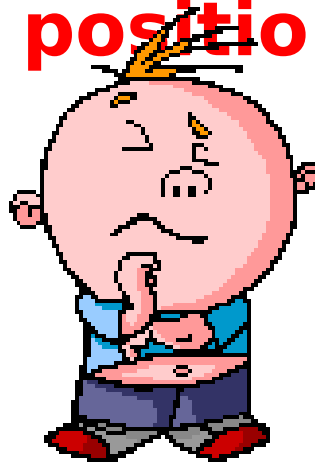
Flexion of metacarpophalangeal joint



https://lh3.googleusercontent.com/iQivREip_fb8J92JmAFYqA

**A muscle which can adduct the fingers and
:put them in the writing position would be**

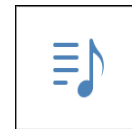
- A. Lumbrical
- B. Palmar interosseous
- C. Dorsal interosseous
- D. Opponens pollicis
- E. Pamaris longus



MCQ

:One of the following is a saddle synovial

- A. Shoulder joint
- B. Wrist joint
- C. Elbow joint
- D. Interphalangeal joint
- E. Sternoclavicular joint



:Suggested Textbook

Clinical Anatomy for Medical Students

Richard S. Snell / Third Edition

Pages 440- 447

517 -506

542 - 540

Thank you